

DEC 16 1927

INDEX NUMBER

Vol. XIV

DECEMBER, 1927

No. 6

# AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY

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# The American Journal of Obstetrics and Gynecology

VOL. XIV

ST. LOUIS, DECEMBER, 1927

No. 6

## Original Communications

### THE OVARY IN OSTEOMALACIA\*

BY JOHN R. FRASER, M.D., MONTREAL, QUEBEC

**O**STEOMALACIA has long been regarded as a disturbance of metabolism peculiar to the female sex, usually found in pregnancy, or at least brought to its fullest development, by the influence of pregnancy. In this disease, the lime salts are abstracted from the bones, first and most noticeably from those of the pelvis, and only in more advanced stages from other bones, the results being curvature and deformity of the pelvis and other bony structures. Fractures appear readily; simultaneously there occur, genetically coordinated, inflammatory, degenerative processes in the nerves and muscles. These latter changes play a striking part in the clinical picture of osteomalacia.

Osteomalacia, as a rule, appears sporadically, but in certain localities it exhibits endemic characteristics, particularly is this so in Japan, Switzerland, southern Germany, and Austria. In these countries its appearance is of frequent occurrence even in certain domestic animals, whereas it is extremely rare in Canada and the United States, especially in its active or developmental stages. These facts show that there is a local exogenous condition which has not been sufficiently recognized, and which plays some part in the origin of the disease; a rather similar state of affairs appears to be true of exophthalmic goiter. Modern opinion leans rather to the theory of osteomalacia being due to a complex pluriglandular disturbance of internal secretion, the chief lesion being in the ovary.

Ever since castration was introduced by Fehling in 1887 as a cure of the condition, offering, especially in puerperal osteomalacia, 93 per cent of cures, the problem presented has been how and in what way can a lesion of the ovary influence the disease of the bone, and what could the nature of this lesion be?

\*Read by invitation at a meeting of the New York Obstetrical Society, March 8, 1927.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

Some progress in the elucidation of this disease has been made by attempting to dissociate the predisposing factors from the particular cause of osteomalacia. Damp houses, unhygienic conditions, lack of meat, water poor in lime, long continued lactation, may alter the balance of the metabolic processes, so that from these causes, or from another as yet unknown to us, a loss of lime salts takes place.

The close bearing of pregnancy on the cause of the disease is of importance. At first sight it might appear that osteomalacia predisposes to frequent pregnancies, and there is available evidence in seeming support of such a contention; the balance of opinion, however, would rather lean to the feeling that frequent pregnancies aggravate the osteomalacia, as even menstruation is known to cause an exacerbation of the symptoms, and the clinical course of the disease is certainly

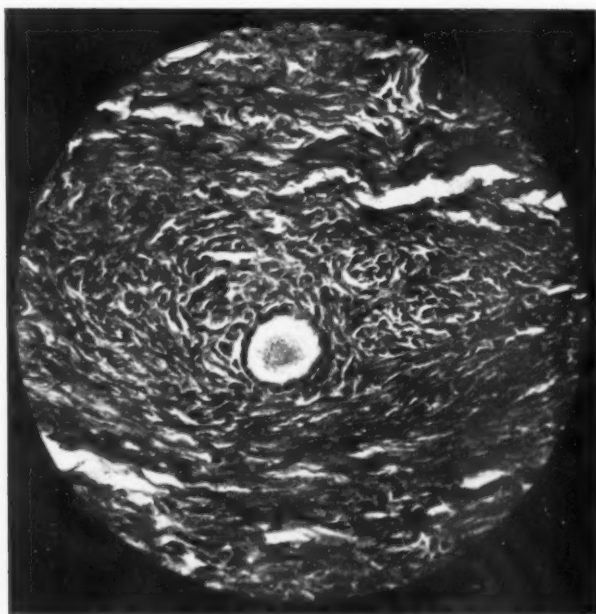


Fig. 1.—Section of osteomalacic ovary showing early degeneration of a primordial ovum. The marked epithelial overgrowth about it is a conspicuous feature.

not influenced for the better by repeated pregnancies. The congestion and excessive functioning of the pelvic organs, together with the necessary loss of calcium and phosphorus, play no inconspicuous part in the course of the disease.

It has been observed by many, among others by Fränkel of Vienna, that the removal of one of these predisposing factors, such as the drainage of any marshy area consequent upon industrial development, has as its immediate result the cessation of the disease in that locality. Surely this fact denies the existence of any simple cause.

Much work has been done, notably by Moussu and Charrin, Archangeli, Levi and others on the etiologic connection of a special bacterial origin of the disease, and experimentally by injections of marrow from infected patients they were able to produce in animals, lesions similar to osteomalacia. Some color is attached to this hypothesis by reason of the sporadic outbreaks of the disease in certain localities. The greatest argument, however, against there being any bacterial



origin of the disease, comes from the demonstrations and views of Fehling, who cured the disease by castration.

The ovaries undoubtedly exert a marked influence on phosphorus metabolism, and the improvement which occurs after the removal of these organs in cases of osteomalacia may be brought about by a retention of the earthy phosphates, whereby the skeletal tissues again acquire their normal rigidity. Unfortunately the experimental work which has been done so far on phosphorus and calcium metabolism in normal and castrated animals, is too contradictory to admit of the deduction of any conclusions calculated to throw light on the phenomenon of osteomalacia.

Blair Bell quotes a 50 per cent reduction in calcium excretion after ovariectomy, and with this he correlates the fact that in young animals there is generally increase in the long bones after ovariectomy. He also observes the retention of calcium and phosphorus after oophorectomy in humans.

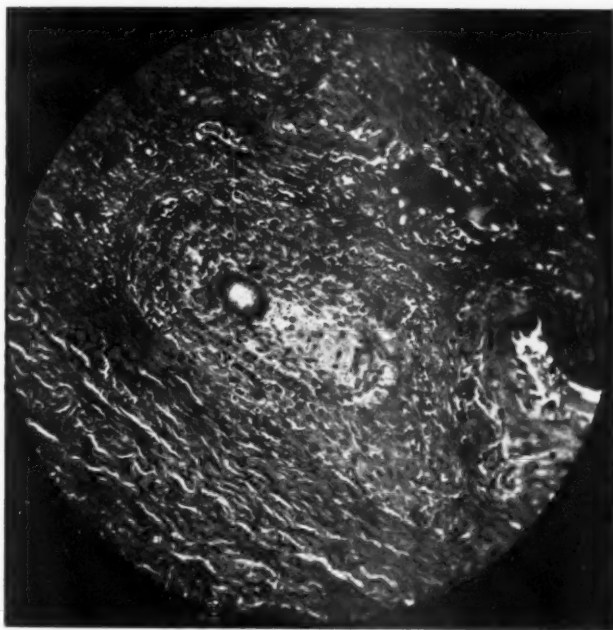


Fig. 2.—Early follicle formation. Coincident with intrafollicular degeneration there is well-marked perifollicular cellular hyperplasia.

It is of some significance that Sellheim, Tandler, and Gross observed that in castrated animals and eunuchs, the medullated bones showed a longitudinal growth.

At this point it is interesting to record the findings in the ovary of a patient who had received roentgen-ray treatment as an experimental attempt to promote castration. Wallart states that this patient was radiated in 1914, and was indifferently well until 1916, when radiation was again tried only to fail, so that castration was resorted to. Here the ovaries showed extensive interstitial gland formation and marked ovarian activity, although ovulation had apparently ceased and the follicles were all atretic. The outstanding feature was the presence of marked interstitial gland tissue. Castration was followed by cure.

It was Fehling's belief that in osteomalacia we are concerned with a trophoneurosis of the bones connected with the genitals and dependent on the changes of the ovary.

Krönig and Pankow report a case where they removed the ovaries and reimplanted one in the pouch of Douglas. So long as the menses were withheld, improvement was noticed, but immediately they recurred with the taking of graft, the symptoms also returned, and the ovary had eventually to be removed.

Since the investigations of the histology of the ovary were apparently unsatisfactory, the attention of investigators naturally turned to other directions, and the several endocrine glands were each considered in turn.

Inasmuch as thyroid disorders are associated with bony changes, it is only natural that it should be considered in this connection, and much evidence was adduced to show the similarity between goiter and osteomalacia with respect to distribution and manifestations, but the treatment based on these lines never gave results. Moreover, Zunz has shown the absence of any change in the

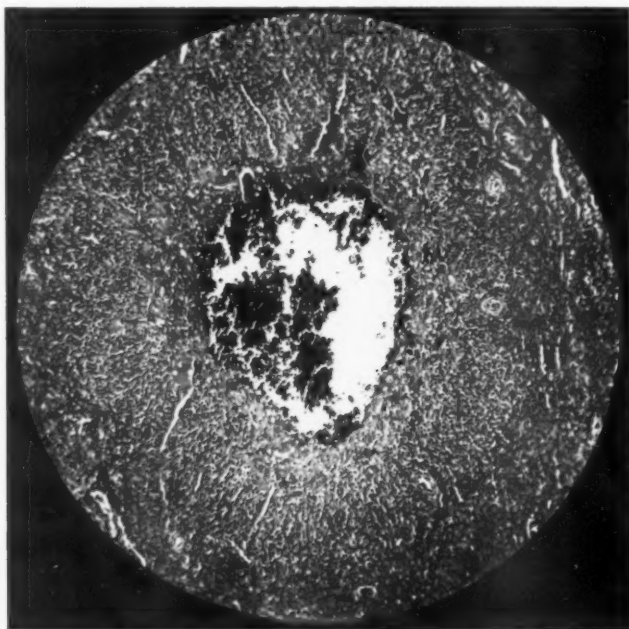


Fig. 3.—Complete intrafollicular disorganization, which has given place to a distinct perifollicular interstitial glandular arrangement, not unlike the adrenal in appearance.

metabolic rate in osteomalacia, and also drew attention to the fact that in both Basedow's disease and myxedema, osteomalacia has been known to occur.

Hofmeister attempted to show a relationship with thyroid insufficiency. Panse removed the thyroid gland in pregnant rabbits, inducing bony changes, and advised thyroid extract in osteomalacia, but no definite results followed.

Erdheim and others have shown some changes in the parathyroid gland in osteomalacia but have produced no conclusive findings or beneficial therapy.

Bossi of Geneva, in 1907, drew attention to the value of adrenalin in the treatment of osteomalacia. No definite results came of the suprarenal theory beyond developing the idea that possibly the adrenalin neutralizes the hypersecretion of the ovary by its vasomotor effect overcoming the existing vasodilatation.

A very determined effort has recently been made by Scipades to connect the etiology of osteomalacia with changes in the thymus gland. Tandler, Klose, and

Matti extirpated the thymus gland in young animals and found as a result that the bones were shorter, their weight less, their consistency soft, flexible, brittle, and easily fractured, and finally that as a result of diminished ossification there was scanty callus formation with cysts in the callus.

Although a physiologic involution of the thymus gland is known to occur in puberty and later life, certain so-called accidental involutions occur from time to time in midsexual life, and are of interest while considering the etiology of osteomalacia. For example, in pregnancy a definite atrophy occurs, while in the puerperium an active hyperplasia takes place, and the organ is generally restored. Similar atrophies are known to occur in acute and chronic infections, cachectic processes, and following roentgen-ray exposure. The chief interest lies in the fact that coincident with thymic atrophy there is a delay in ossification. When the thymus gland is removed experimentally there is very little change in the

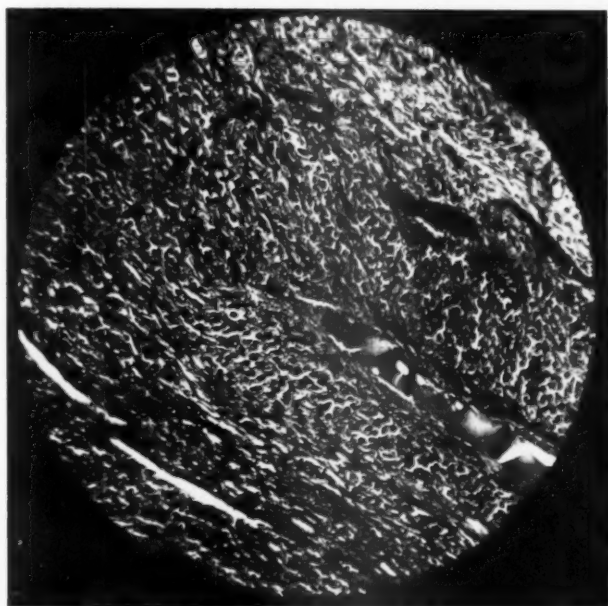


Fig. 4.—A cortical interstitial gland formation showing collapse of follicle as the result of pressure. The perifollicular gland formation is actively represented.

genitals and little or no ovarian activity, whereas on the contrary castration is followed by great thymic enlargement.

Even though Scipiadès has produced bony changes in animals by removing the thymus gland it must be remembered that he did so in young animals in the growing stage, and also that he was unable to reproduce the increase in the genital activity which is a clinical fact recognized by all workers in the field.

We are encouraged by these experimental failures to turn again to the ovary, in the hope that, as a result of more recent developments, some light can be thrown on the state of the ovary, and on the interpretation of changes there.

With the advent of castration into the therapy of the disease there have naturally been countless histologic researches undertaken on the

extirpated ovaries. The results have been many and varied; a definite hyperemia, sometimes hyaline degeneration of vessels, or a high degree of friability have been observed at times, but as these are appearances which have been noticed in other conditions, they cannot be said to possess any great significance. The only real light which has so far been cast on the subject has been contributed by Wallart who has drawn attention to the development of the so-called interstitial gland tissue scattered through the ovary.

The admirable observations of Limon and Bouin have clearly depicted for us the meaning of the so-called interstitial gland of the ovary. In anatomic nomenclature what is generally understood by the term "interstitial tissue" is the

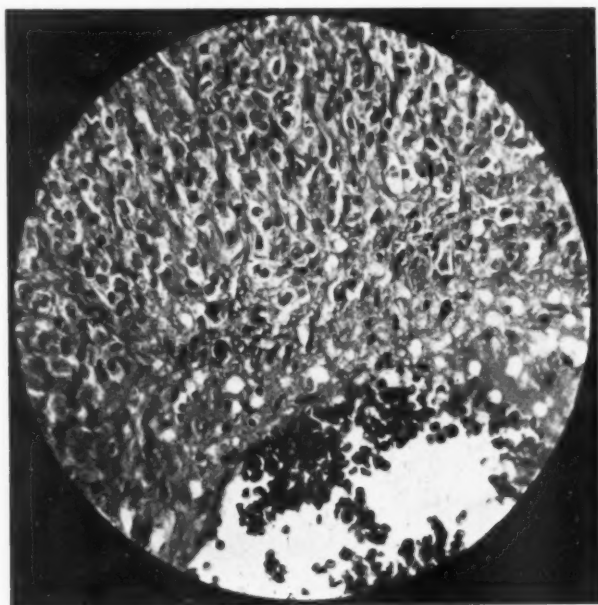


Fig. 5.—Section showing the edge of an atretic follicle with a segment of the perfollicular hyperplasia illustrating the extreme depth of the epithelial proliferation.

ordinary interstitial or connective tissue, which forms the stroma of most of the organs, and acts as a substratum to the various separate elements, which grouped together are called parenchyma. The parenchyma is very naturally the most characteristic element of an organ and differs in each one. The interstitial tissue, on the contrary, shows very few variations in its structure, being always of a supporting character, fibers and cells. In the ovary the distinction between the two tissues is established from the beginning; the elements of the parenchyma, the covering epithelium, the graafian follicles, to which are added the yellow bodies and the medullary fasciculi, all the rest of the organ being interstitial tissue. Later, however, there are found among this tissue new elements very different from those usually present; these are voluminous cells of a polyhedral shape often filled with a fatty substance and bearing no relationship to the stromal cells.



Similar cells are recognizable in the connective tissue of the testicle, and the name given to both is "interstitial cells."

It would seem according to Limon that the false yellow body, or as Koelliker prefers to call it, the atretic yellow body, has not the same destiny as the true, these latter being really ephemeral, while the atretic yellow bodies are destined to form the true interstitial tissue. His, in describing these cells in animals, believes that it is erroneous to say that they are degenerative signs, because they always appear in areas richly supplied with blood vessels, and in my own series a vessel always lies in the center or thereabouts.

It is a fact observed in animals, that the interstitial cell tissue, contrary to former beliefs, is not subordinate to follicle activity, as Plato would have us believe, but that the sections rather show the follicles replaced by interstitial

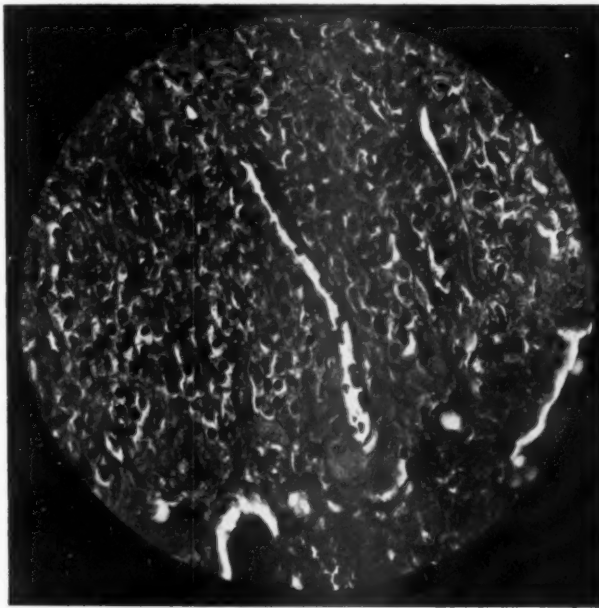


Fig. 6.—The vascularity of these interstitial gland formations is, like other endocrine glands, very evident. Note the large vessel lying in the midst of the gland columns.

tissue. The vascular arrangement of interstitial tissue is very suggestive of secretory activity, and rightly or wrongly Bouin styles this an interstitial gland.

The microscopic findings in these ovaries of osteomalacia are often very variable and if one reviews the reports of the innumerable histologists in this field, a great variety of results are encountered. Many observed follicular activity, others marked follicular inactivity; some, follicle atresia and interstitial gland activity. In all, a certain definite increase in vascularity is remarked, and in many the appearance of a decidua-like tissue especially in the medulla is noted, together with very marked areas of hyalin degeneration scattered here and there in both the cortex and the medulla.

Many attempts have been made to reconstruct an osteomalacic ovary, one whose features would suit every case by the constancy of its findings but no very characteristic picture has been evolved.

The specimen which I have had the privilege of studying was removed from a young woman in midpregnancy, who developed a well-marked osteomalacia with characteristic bony changes. Prompt castration led to a cure of the condition. I am indebted to Professor Oskar Fränkel, of Vienna, for the specimen.

The interest in this case lies not only in the somewhat striking appearances present, but in the results of comparison with ovarian hyperplasia in other conditions. I shall therefore confine myself to a report of observations in the first place on the malacic ovary and then in the changes found in the ovaries of two young women who suffered from severe hemorrhage of the so-called idiopathic variety.

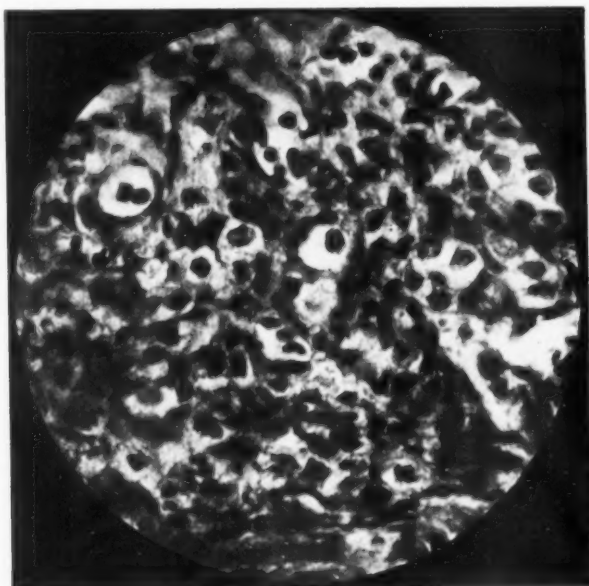


Fig. 7.—Interstitial gland cells under higher magnification.

The ovaries have been prepared in the usual manner, following formalin fixation, serially cut, and stained with hematoxylin and eosin. Frozen sections were also made and stained with Sudan, scharrlach r, etc.

In the osteomalacic ovary, the cortex and in fact the entire ovary is in a great state of excitation, all the glandular and interglandular tissues are hyperplastic and there is a very marked and universal congestion throughout the ovary. The presence of widespread follicle formation is at once apparent; the ovary contains many small cysts dotted here and there throughout the organ. All stages of follicle development from the smallest primordial follicle to several fullblown graafian follicles are demonstrable, but throughout them all there are evidences of degeneration within, plus a well-marked hyperplasia of the thecal cells without. A dropsical swelling of the primordial follicles is very clear, the nuclear matter

shows degeneration, and the usual garland of cells about the periphery is firmly pressed against the stroma, as though the follicle had been overfilled with fluid. In the larger graafian follicles few perfect examples of the typical mature follicle are to be found; changes of a degenerative character are everywhere manifest, which is a distinct contradiction to the picture one would expect in pregnancy. The ovum, when present, invariably shows degeneration; the nucleus may be fragmented or missing; the zona pellucida about it is thickened and hyaline, and often the discus proligerus is greatly enlarged. The cells in the discus are closely packed together; the vascularity is well marked, and the granulosa layer is everywhere in a hyperplastic state. Slavjanski's membrane is clearly marked. The theca is slightly increased and the cells are transformed into masses or cords of closely packed polygonal-shaped cells with large, often eccentrically placed,

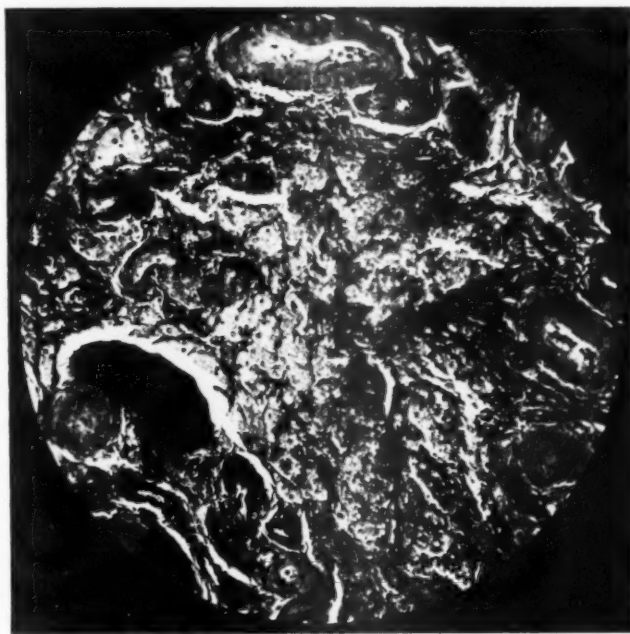


Fig. 8.—Showing the almost telangiectatic appearance of the medulla due to excessive vascularity of the ovary. The relics of gland formations are seen in the center, suggesting the origin of the vessels.

nuclei and large cell bodies. At times this thecal proliferation is confined to one side of the follicle, but there are also instances where, in a uniform thickness it may be seen encircling the follicles. It is a point of some value that so many maturing follicles should be visible in pregnancy. The corpus luteum of pregnancy is very well shown, the chief appearances are those of beginning involution; there is only a slight thecal hyperplasia which is not always uniformly distributed. Atretic follicles of widely varying appearances are everywhere visible and are represented by large cysts, small cysts, and even by mere slits lying transversely in the deeper layers.

Much interest must of necessity center about the thecal cell proliferation of these atretic follicles,—the structures which have been variously described as false yellow bodies (Bouin) or interstitial glands. We can at once recognize the presence

of voluminous cells of a polyhedral shape, often full of a fatty substance, lying in the cortex free or distributed about these atretic follicles. They bear no apparent relationship to the ordinary stroma cells.

There is not sufficient evidence to lead me to agree with Schroen (Limon) that these formations which occur mostly in the medulla and penetrate into the cortex about the follicle zone are derived from the complete breaking up of the yellow bodies and only assist in the formation of cortical structures. They are themselves definite formations.

Tourneux and Bouin, working on lower animals, are very pronounced in their views on the interstitial gland development, and believe that these interstitial cells of the ovary are very like the similar cells of the testicle, particularly directing attention to the apparent physical resemblance between interstitial cells of testicle

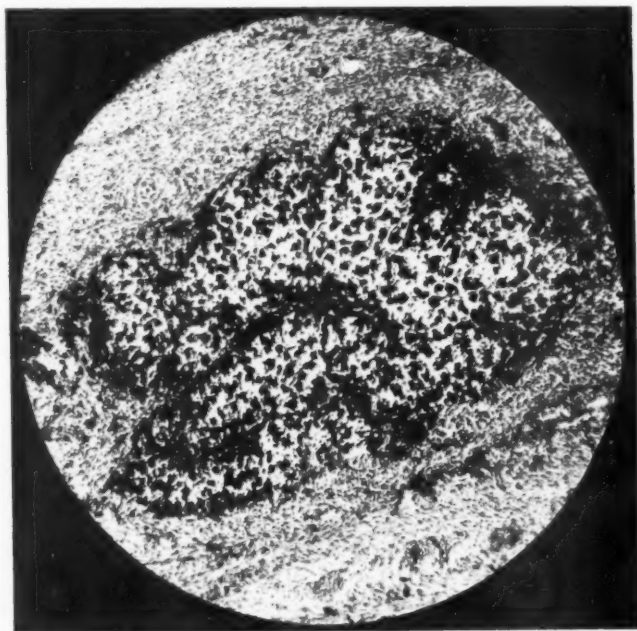


Fig. 9.—Showing reaction of the cellular heaps to fat stain, with marked lipid contents of cells.

and ovary, lutein cells of the yellow bodies, and cells of the uterine mucous membrane which form the decidua.

One must be considerably perplexed by the presence in abundance of these cellular heaps in the cortex, sometimes near the tunica albuginea about early follicle formations, or distributed generously about the larger atretic follicles. Their development must be admitted somewhat at the expense of the follicles, for the considerable proliferation of cells outside the follicle is at once the signal of a beginning degeneration within.

These interstitial formations show in their general topography slightly different aspects, according as one studies them in the cortex or in the medulla. In the cortex the cells are often gathered into compressed heaps of generally uniform configuration; usually they are in thin elongated rows arranged about the surface, varying in thickness. They may present a front of a few cells or of very many. In the medulla there is more of a tendency to the formation of solid cords. At



times in the center of the cords a fusiform elongated cavity may be observed following the axis of the cord; sometimes it is reduced to a mere slit.

The early stages of follicle formation exhibit interesting changes. The granulosa cells are, as a rule, well developed; the follicle secretion is often present; the ova are often degenerate, and frequently bleeding will be seen to have occurred in the lumen. The thecal demarcation is always well preserved, and the peripheral cell formation is always extremely marked and decidedly active, as shown by deeply staining cells with a large amount of protoplasm, and large nuclei undergoing divisions. The vascular architecture even in these early stages is at once a conspicuous feature. At times blood cells would appear to be almost lying in contact with the cells; such a condition can only indicate an arrangement for the immediate transference of this secretion to the circulation. Few follicles of the

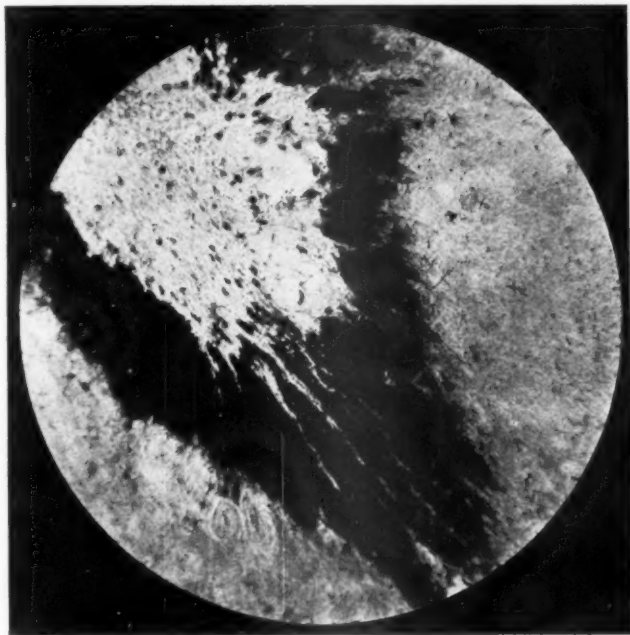


Fig. 10.—Showing fat reaction in a large follicle.

subcortical region whose theca interna is transformed into interstitial gland tissue still possess the unaltered granulosa epithelium.

In numerous places it was possible to show a cluster of large cells about even the primordial ova, as though even here a hyperplastic process had been inaugurated. Furthermore one finds hyaline substances which are like corpora albicantia, of round or oval shape, in whose vicinity lie large yellow cells in the form of a loose wreath; their granules sometimes give a Sudan reaction but soon cease to alter under the influence of various reactions. Much more commonly there is found a species of atretic follicle whose cavity either shows a rounded form or has begun to collapse. The theca interna cells are plainly epithelioid and possess fine protoplasmic deposits which take a red color with Sudan.

Almost all continental observers, such as Orthmann, v. Velits, Heyse, Fehling, Rossier, and Lohlein are at pains to emphasize the presence, especially in the medulla, of many vessels of large size whose walls in many cases appear thickened and exhibit hyaline changes, but in no instance is any explanation offered for this

almost telangiectatic condition. It would seem to us a possible explanation that one is here dealing with the vascular architecture brought into being by the very active perifollicular changes, and that inasmuch as this gland tissue is scattered everywhere throughout the organ it may become degenerated and disappear, leaving only this scaffolding of blood vessels behind.

When treated with Sudan or scharlach r these interstitial cells appear as large irregular-shaped cells with large nuclei and a wide protoplasmic margin, in which lie pigment and fat globules. The Sudan reaction is a conspicuous feature, the cells forming a wreath or mantle about the fibrous bodies. These bodies are shown by the fat reaction to be very numerous in all the sections of the ovary, and while this is a condition not by any means confined to osteomalacic ovaries, it is not often seen developed to such a great extent about atretic follicles and in the cortex generally.

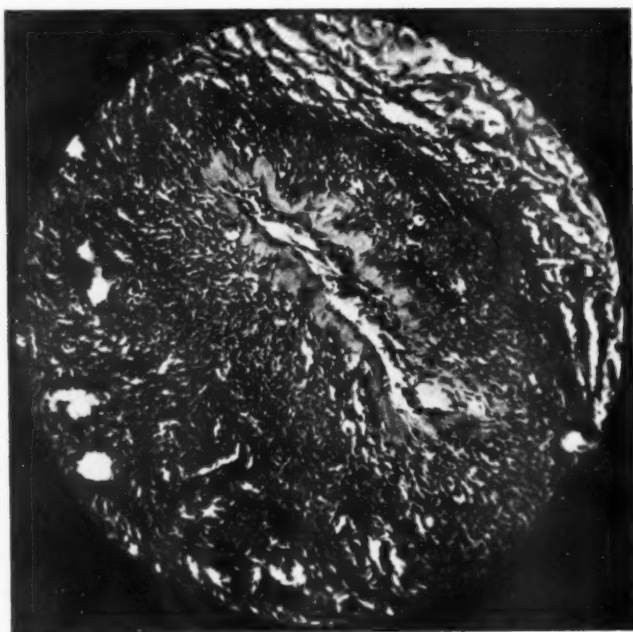


Fig. 11.—Perifollicular gland hyperplasia in a young girl suffering from metrorrhagia at puberty. Note the replacement of the follicle by this epithelial body formation.

If by contrast, one examines the ovary of a young woman who has suffered from irregular menses, bleeding constantly for a period of months, one is impressed with the presence of many forms of atretic follicles, about which are gathered varying amounts of hyperplastic thecal epithelium, at times forming blocks of cells of very active appearance. In almost every instance intrafollicular activity has been arrested, the granulosa is thinned with a thin connective tissue underlying it, and greater activity is visible in the perifollicular region, which, as above indicated, is a mass of large deeply staining cells possessed of a well-organized structure, a well-defined circulatory apparatus, and cells with conspicuous nuclear markings.

Every gradation may be seen between the large beginning atretic follicle with comparatively slight interstitial gland formation, to the small slitlike structure with very heavy perifollicular activity. In addition one is struck by the amount of

special stroma tissue, and by the suggestion of the passage of these atretic structures into special stroma structures, almost formless masses. True graafian follicle activity is not in evidence, as was the case in the osteomalacic ovary; the vascularity is not so pronounced, and the muscle tissue is decidedly less. Stained with Sudan, the lipid bodies show as finely distributed droplets. There are no signs of the collections free in the cortex of these epithelioid cells, as in osteomalacia.

Recently the opportunity presented itself of studying the ovary of a young girl at puberty in whom there had been irregular bleeding together with other disturbances occasionally encountered in puberty. She was of a fairly large, well-developed type, with heavy bones and large stature generally, although not obese, a pituitary

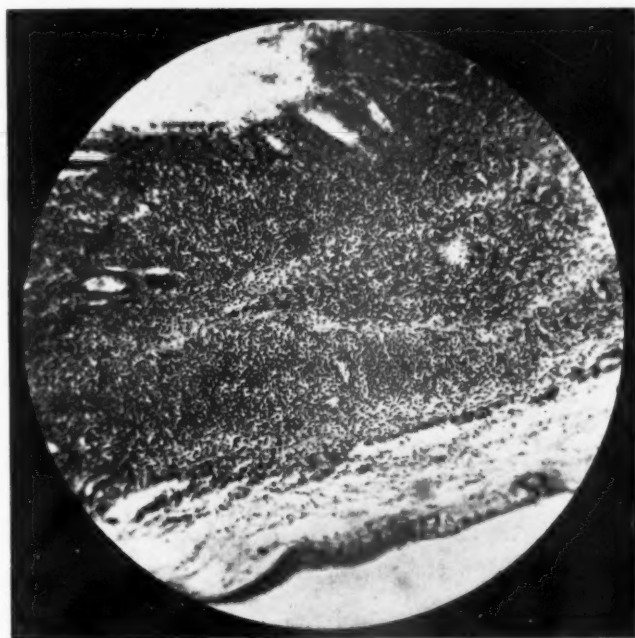


Fig. 12.—Widespread interstitial gland formation in the cortex of an ovary of a young girl at puberty.

type and undoubtedly the victim of pluriglandular disturbance. There were great evidences of ovarian activity, congestion, follicular hyperplasia, all gradations of follicle ripening, together with very marked evidence of interstitial gland formation, somewhat resembling the osteomalacic ovary, but differing from it by the absence of such widespread cortical hyperplasia, and by the persistency of granulosa cells; the type of cell is decidedly smaller and shows very scanty fat formation.

Zondek and Aschheim have recently shown the remarkable influence of the pituitary on the follicular apparatus of the ovary. The experimental production of interstitial gland formation at the expense of

the maturing follicle by the excessive stimulation by pituitary is of value in interpreting these osteomalacic changes in the human ovary.

One's ideas cannot but be influenced by the fact that after disturbing the ovarian function by castration, the symptoms of osteomalacia often decrease or disappear, so that, for example, a bony structure which has shrunk together, may be partially restored and made to function. It has certainly not been proved whether this is a case of a completely pathologic abnormal function, or merely that of the normal activity during pregnancy being increased by the disease. The ovarian function of internal secretion is probably connected like the

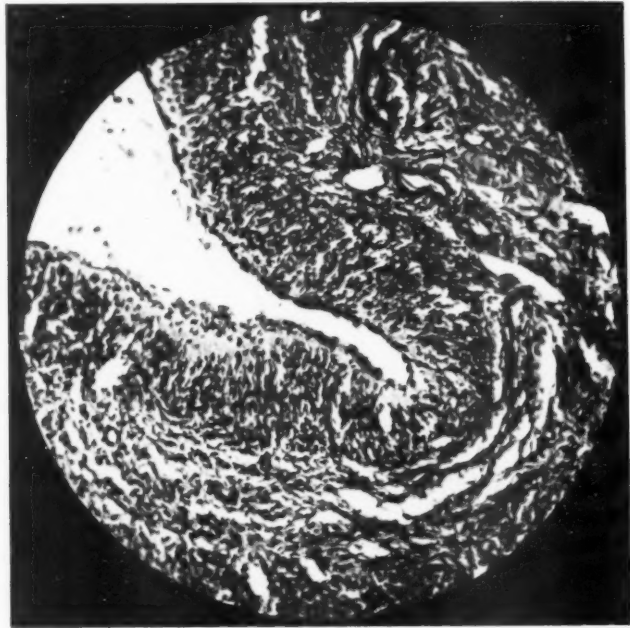


Fig. 13.—Interstitial gland formation in ovary of a young woman suffering from metrorrhagia. The thecal hyperplasia assumes an appearance similar to that in osteomalacia.

follicle epithelium, with those elements which, by their whole character, show their origin to be in the gland cells. To these belong also the corpus luteum and interstitial ovarian glands.

Hanau has studied the alterations in bones during pregnancy, which are corrected immediately after birth, and he believes with Birsch-Hirschfeld that the bony alterations in osteomalacia represent an exaggeration of the normal process. Does not this ovarian activity and interstitial gland formation likewise represent only a further stage of what occurs normally during pregnancy, for we are reminded by many authors that interstitial gland tissue is present in



normal pregnancy. One can hardly be mistaken in considering that these changes in pregnancy and also in osteomalacia are primarily influenced by the functions of the sex glands.

#### CONCLUSIONS

In this preliminary report no attempt has been made to fasten or attribute to the ovary, disturbances which would completely account for the changes in osteomalacia, for countless observations on the several ductless glands show them to be definitely affected. Thus, the pituitary, thymus, adrenal, and parathyroid disturbances may well be symptoms of a complex pluriglandular disturbance, but one does feel confident that this somewhat decided ovarian hyperplasia plays a prominent part in this process, as shown by the following:

The prompt cessation and permanent cure of many cases after castration.

The occurrence and aggravation during pregnancy, or even during menstruation, of the osteomalacic state.

The failure of other endocrine therapy.

The high degree of fertility in osteomalacia.

The occurrence in the ovary of structures which must be associated with specific ovarian functions.

The intense vascular changes in the ovary, congestion with almost the development of a telangiectatic condition.

The presence of almost mature graafian follicles during pregnancy, with a well-marked corpus luteum.

The occurrence of interstitial gland formation in pregnancy and at puberty, and such other times, when one expects ovarian hyperfunction, together with the fact that certain bone changes slightly resembling osteomalacia occur normally in pregnancy. All these facts seem to indicate that in the condition known as osteomalacia, one probably has to deal with a process closely related to ovarian hyperactivity, and that this excessive ovarian function becomes in some way diverted along pathologic lines.

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(For discussion see page 837.)

593 PINE AVENUE WEST.

## THE FORMATION OF AN ARTIFICIAL VAGINA BY A NEW PLASTIC TECHNIC

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(From the Department of Gynecology, Mt. Sinai Hospital)

THE two best accepted technics for the formation of a vagina in malformed individuals, are the one, the method of Baldwin<sup>1</sup> which utilizes a double barrel segment of the small intestine transplanted into the rectovesical septum (53 cases with a mortality of 20.75 per cent), and the other the operation of Popow-Schubert<sup>2</sup> in which the lower rectum is transplanted into the vulva, the upper rectal segment being utilized for reestablishing the continuity of the intestinal canal (53 cases; no immediate operative deaths; 2 died of sepsis; frequent intestinal fistulae and varying degrees of incontinence. Franz<sup>3</sup>).

Other less dangerous methods, such as the homoplastic transplantation of vaginal mucosa obtained from other patients (Küstner, Mackenrodt), Thiersch skin grafts, Douglas peritoneum transplants (Stoeckel-Kroemer), utilization of the labial mucous membrane (Bumm, Graves), have given almost uniformly unsatisfactory results, because of subsequent scarring and contraction with consequent obliteration or stenosis of the newly formed canal. The same applies to the use of a pedunculated skin flap with immediate flap transplantation (Fraenkel<sup>4</sup>).

Because of the fact that an artificial vagina is made solely for the purpose of establishing a coital organ, it seems unjustified, in our opinion, to undertake an operation which involves grave risks. We have frequently refused to operate at all in unmarried individuals with no strong sex urge. Occasionally, however, individuals present themselves, either married or with strong sex feeling, in whom it

seems justified, for the sake of the happiness of the patient and that of the husband, to attempt to establish a vagina, in spite of the danger incident to either the Baldwin or Schubert operation. In the last case which presented itself, a woman divorced because of impotentia coeundi, we tried a new technic which appears entirely devoid of danger and which has now, after a period of over six months, given a satisfactory and apparently a permanent result.

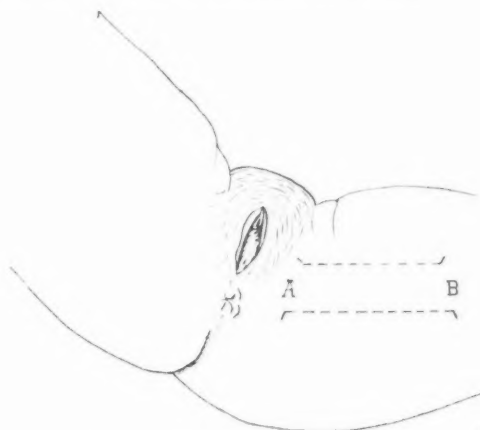


Fig. 1.—Patient in lithotomy position, absence of vagina. Outline of skin flap between A and B, the dotted lines representing the incision. This flap was undermined completely but remained attached at A and B.

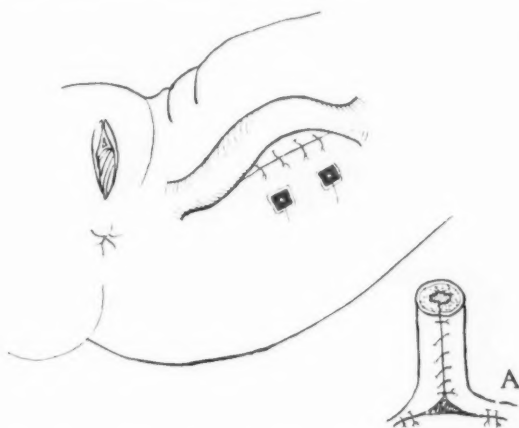


Fig. 2.—Tubular flap after union of skin edges. Beneath the tube the skin gap on the thigh has been approximated by two shot and plate tension sutures and interrupted skin sutures. A shows a schematic cross-section of the tube seen from beneath with an empty inside core to allow for edema. The method of approximating at the base is shown. It appears wise to leave a small triangular area uncovered for drainage.

Our aim was to devise (1) a well vitalized skin flap, devoid of hair; (2) a flap readily and freely movable for transplantation; (3) a flap with a raw surface free of infection. We have obtained such a flap by modifying the tube-flap method described by Gillies and others.<sup>5</sup>

## TECHNIC

The flap is outlined along the inner surface of one thigh by making two parallel incisions extending from the hairline close to the labia, downward along the long diameter of the thigh for about seven inches. Between these two incisions which are placed three inches apart, the skin and underlying fat are undermined down to the fascia lata for the entire length of the incisions. (Fig. 1.) If, as we found, there is too thick a layer of fat, some of the subcutaneous tissue may be carefully trimmed off from the deep surface of the flap. The long narrow flap, attached

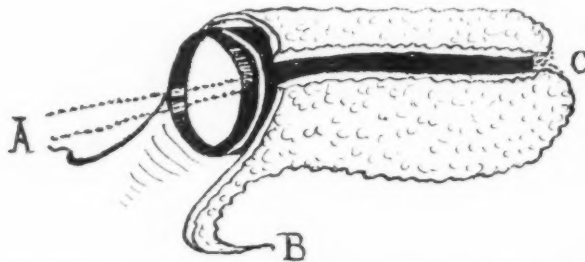


Fig. 3.—Skin flap detached at distal end, split open, and wound around hard rubber vaginal speculum. At C the two guide sutures have been passed, pulled through the speculum and appear at A, thus inverting the top of the new vagina. The line A to B represents the base of the flap.

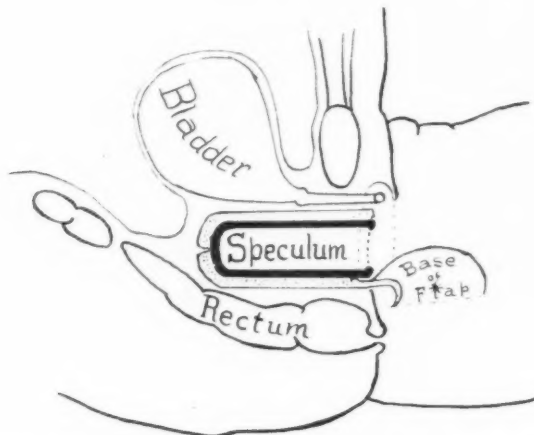


Fig. 4.—Schematic section of pelvis showing the speculum covered with the flap introduced into the new formed gap between bladder and rectum.

merely above and below, is now sutured together with the raw surface turned toward the inside of the tube, by a continuous or interrupted fine silk suture which takes in merely the skin, completely inverting the subcutaneous tissue. (Fig. 2.) At the upper and lower ends where the skin attachment is maintained, small nicks of about  $\frac{1}{2}$  inch, directed diagonally outward from the flap, will allow better approximation of the lower portion of the tube. (Figs. 1 and 2.)

The denuded area on the thigh, left open beneath the bridge-tube flap, is closed by undermining the skin laterally (keeping close to the fascia lata) until the two skin edges can be brought together without undue tension beneath the newly established skin tube. If tension is encountered, 2 or 3 shotted, plate sutures may be

adjusted before the skin edge is approximated with a running or interrupted catgut suture (Fig. 2). A very light dressing which exerts little pressure on the tube-flap is applied.

If the tube has not been made so long as to impair its nutrition, the distal end of the flap may be partly incised two weeks from the primary operation, in order to force the proximal pedicle to assume more and more of the nutrition of the entire flap, but care must be taken not to completely disconnect the distal attachment, until the final step of the operation is to be accomplished, as otherwise retraction and shortening may take place.

The third and final step consists in establishing (1) a canal in the rectourethral vesicle septum by incising in the vulvar orifice and separating bluntly the loose connective tissue between the urethra and bladder anteriorly and the rectum posteriorly, for a distance of at least  $3\frac{1}{2}$  inches, preferably until the peritoneal fold has been encountered and pushed up; (2) (a) the complete cutting across of the



Fig. 5.—Appearance of skin tube two weeks after first step of the operation. A points to area of necrosis due to an error in fashioning the flap.

distal end of the flap; (b) the splitting of the flap along the original line of skin union; (c) the careful excision of such subcutaneous scar tissue as has formed in the interior of the flap. The flap when unrolled, forms a large, supple, uninfected skin flap which is further mobilized by extending the incisions at the base of the pedicle prolonging the two incisions first used, almost up to the vulva; (d) turning the pedicle through an arc of 180 degrees and then folding it over an appropriate hollow vaginal plug or speculum with its raw surface outward, the epithelial surface in contact with the speculum. (Fig. 3.) Near the top of the speculum two holes have been bored. Near the free end of the flap two strong silk guide sutures are passed (Fig. 3-C), and pulled through the speculum so as to appear at its open end (Fig. 3-A). This maneuver turns in the top of the flap so



as to form the upper blind end of the vagina and at the same time supplies a drainage opening for discharges. If necessary, the longitudinal edge of the flap can be secured to the speculum by a few transverse sutures. (e) Introduce the speculum and flap into the gap between the rectum and vagina (Fig. 4), (f) uniting the free end of the anterior portion of the flap wherever possible with the vulvar skin.

In eight days the speculum may be removed. Either then or four days later the base of the flap as it enters the new formed vaginal opening, is completely severed and the edge of the new vaginal tissue united to the vulvar edge. The redundant base of the flap is turned back on to the thigh and is used to cover the granulating area left on the thigh close to the vulva.

The resulting vagina should be dilated with plugs by the patient for a period of time varying from two months to a year until the danger of possible contraction is passed.

The first case which we operated according to this technic is as follows:

The patient was a feminine looking person, twenty-six years old, married but divorced, who had never menstruated. She gave the history of attacks of pain in both upper flanks occurring almost every month although not very regularly. Sex desire was strong.

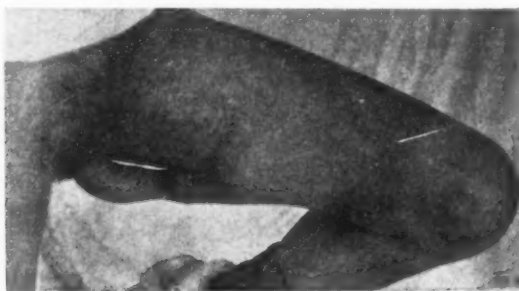


Fig. 6.—Another view of the tubular flap showing its relation to the vagina and the hair line.

General physical examination was negative except for a slight thyroid enlargement, hirsuties on upper lip and abdomen.

Pelvic examination showed a normal vulva with urethra moderately dilated; a blind inelastic vaginal sac, 1.5 cm. long, resulting from the failure of a previous attempt at forming a vagina. Rectal examination revealed no uterus. With a bladder sound in place, the rectovaginal septum was found to be extremely thin. The feminineness of this person was established by demonstrating the female sex hormone in her circulating blood. (Frank, R. T. and Goldberger, M. A.)<sup>6</sup>

On March 18, 1926 the first stage operation for construction of a vaginal flap was performed.

A full-thickness skin flap about 3 inches wide and 8 inches long was freed from underlying fascia lata of the upper inner side of the left thigh, extending longitudinally down the thigh, and remaining attached at each extremity. The edges of the flap were approximated by a series of catgut sutures turning the subcutaneous fat inward and leaving a cylinder covered by skin. (See Figs. 1 to 4.)

Too thick a layer of subcutaneous tissue was allowed to adhere to the skin. In consequence of this the skin tube was tense. Next day edema had increased this tension. To this we attribute the superficial necrosis which developed in one part of the flap (Fig. 5-A).

Following the above operation the patient's temperature rose to 103°, subsequent examination showing that she was suffering from pyelitis. She was cystoscoped, the ureters catheterized, with immediate improvement of her condition.

The wound healed well with only slight sloughing, leaving a flap which was covered with skin, continuous with the thigh above and below. (Figs. 5 and 6.)

May 29, 1926, partial incision of the tubular flap: The flap was incised at distal end, halfway through its diameter, the cut edges united with silkworm gut sutures. The above procedure was only partially successful as the line of incision showed a tendency to reunite.

June 22, 1926. Operation, utilization of tubular flap for construction of artificial vagina: The flap was completely separated at its distal end, split longitudinally and thinned by removing some fat from its internal surface. The rudimentary vagina was split transversely in the midline and the cellular tissue separated by blunt dissection for a distance of about 3½ inches. Incisions carried laterally on each side, widened the vulvar orifice.

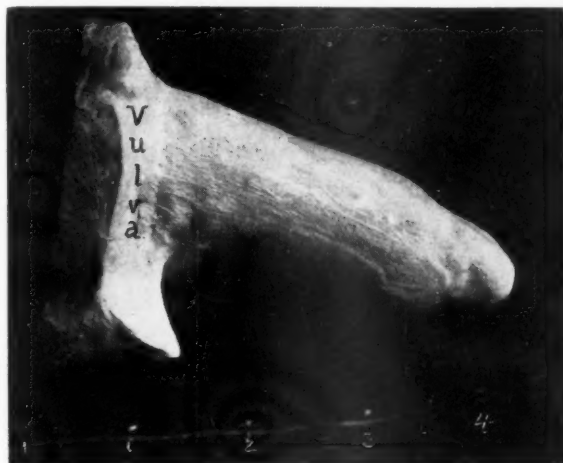


Fig. 7.—Positive made from impression taken of new vaginal canal showing its liberal dimensions and correct shape.

The flap prepared as described above, with the subcutaneous surface on the outside and skin in contact with the speculum, was wound around a tubular speculum and this instrument inserted into the newly made canal so that the raw surface of the flap came in contact with the pelvic cellular tissues.

Following this operation there was some superficial sloughing of tissues in the vagina but the entire flap "took." June 30, 1926, silkworm gut sutures were removed and the speculum was taken out of the vagina. Recovery was uneventful.

This patient has now been under observation for seven months. The new formed vagina is now approximately 4 inches in length and readily admits two fingers. The perineal body is good. Fig. 7 is a photograph of a plaster cast showing the dimensions of the vagina.

This new method is recommended for further trial. It is devoid of danger and permits the using of healthy, well-nourished, fully mobilized skin flaps, devoid of hair.

In the next case which presents itself for operation, we may take a smaller flap from the inner side of each thigh, utilizing one for the anterior and lateral, the other for the posterior surface of the canal, in order to obviate any possibility of necrosis due to undue length of the single flap, and to give ample material for covering.

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(For discussion, see page 835.)

## THE "SAFE PERIOD" AS A BIRTH CONTROL MEASURE\*

## A STUDY AND EVALUATION OF AVAILABLE DATA

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## A REPORT FROM THE COMMITTEE ON MATERNAL HEALTH

AN INQUIRY concerning that part of the menstrual cycle supposed to be free from risk of pregnancy must take up both the search for general rules and for some test or tests that may be applied to the individual woman. At present the second would seem to be the more promising trail to follow. The problem as a whole has three main aspects, statistical, therapeutic, and theological.

An integral part of this research is the attempt to define the day or days of maximum fertility, in order, for example, to furnish exact advice in cases of relative infertility or to so place conception as to avoid the feeding problems of unfavorable birth seasons like July and August or times of travel.

Is there a "safe period"? Yes, for certain women. If we deny this, we must discredit, on our case records, the entries from statements made by a small number of intelligent, seemingly credible patients, who affirm that they have been able to avoid pregnancy through omitting precautions during a given group of interval days and have conceived at will during some other part of the interval. The records are too few, however, and the evidence of the absence of other possible causes of infertility during the sterile days too inexact to label this testimony unimpeachable. To carry full weight each patient should have had a number of children and offer records made throughout their histories rather than mere memory. The assembling of a series of histories of patients with "safe periods" has not been done, as far as we know, nor has this record been coupled with vaginal

\*Read in summary at a meeting of the New York Obstetrical Society, March 8, 1927.

smears for the sterile and fertile periods to place ovulation, or with tube insufflations, or inspection for temporary cervix catarrh, or other tests that might bear witness to various factors involved.

We approach the question of infertile days among women with whom the dates of the last period are known from a half dozen different angles. (1) Records of pregnancies resulting from isolated intercourse. (2) Ovulation as studied at laparotomies or on removed ovaries. (3) Effect, on the subsequent period, of a castrating irradiation given at different days of the interval. (4) Studies of the age of very young embryos. (5) Types of tubal contraction and alterations in epithelial layers as found in women and shown to occur, in animals, at egg-passing time. (6) Hormones in the blood at different times. (7) Vaginal smears.

In a matter where we must repeatedly compare parts of the menstrual cycle, the graphic charts (Figs. 1, 2, 3) which I have brought together from various sources may well constitute the chief item of the presentation. The Ott (*A* in Fig. 1) and Schroeder (*G, H* in Fig. 3) charts are direct copies. The others are recast from the data on a scale and in a sequence favorable for deduction. The evidence is given with a fulness that may seem confusing, but it is only thus that one may separate and evaluate the items and the witnesses. On the matter of ovulation shown at laparotomy I have ventured to weigh the evidence a little in this way. Series which have not shown sections of corpora lutea for estimate of age cover a less area. The older and partially supplanted observations, such as the laparotomies of Leopold and his followers, or of Mall on young embryos, have been omitted. No theory has been allowed to affect the entries of evidence.

One cannot, as is readily seen, work these conflicting indications into a snug schedule fitting a clear cut rule, but one may thus, for the first time, observe some massing of evidence, such as the rather spectacular piling up of ovulation-operation data toward the nineteenth day and the nearly complete absence of cases afterward. This, it will be observed, fits the low point of conception below. The chart has had to be cast as if the twenty-eight day type of cycle was standard. The variations are shown on section *D* (in Fig. 2) but we may not forget that this four week standard is only a convention and convenience as it fits something less than three-fourths of women in temperate climates.

*The Wave of Well Being.*—Turning to the first section of the chart *A* (in Fig. 1) one may quote De Lee. "If one studies the life of woman carefully, clinically, and with the help of physical methods, one can determine an ebb and flow in her activities, mental and physical. This cyclic movement, or periodicity, reaches the highest point of its tide just before the appearance of the menses. The functions of

the body, reflex excitability, pulse blood pressure, pulmonary activity, heat radiation, temperature, excretion of urea, and muscular power all indicate increase according to the line in the figure, up to within a day of the menses; on this day there is an abrupt regression, then a

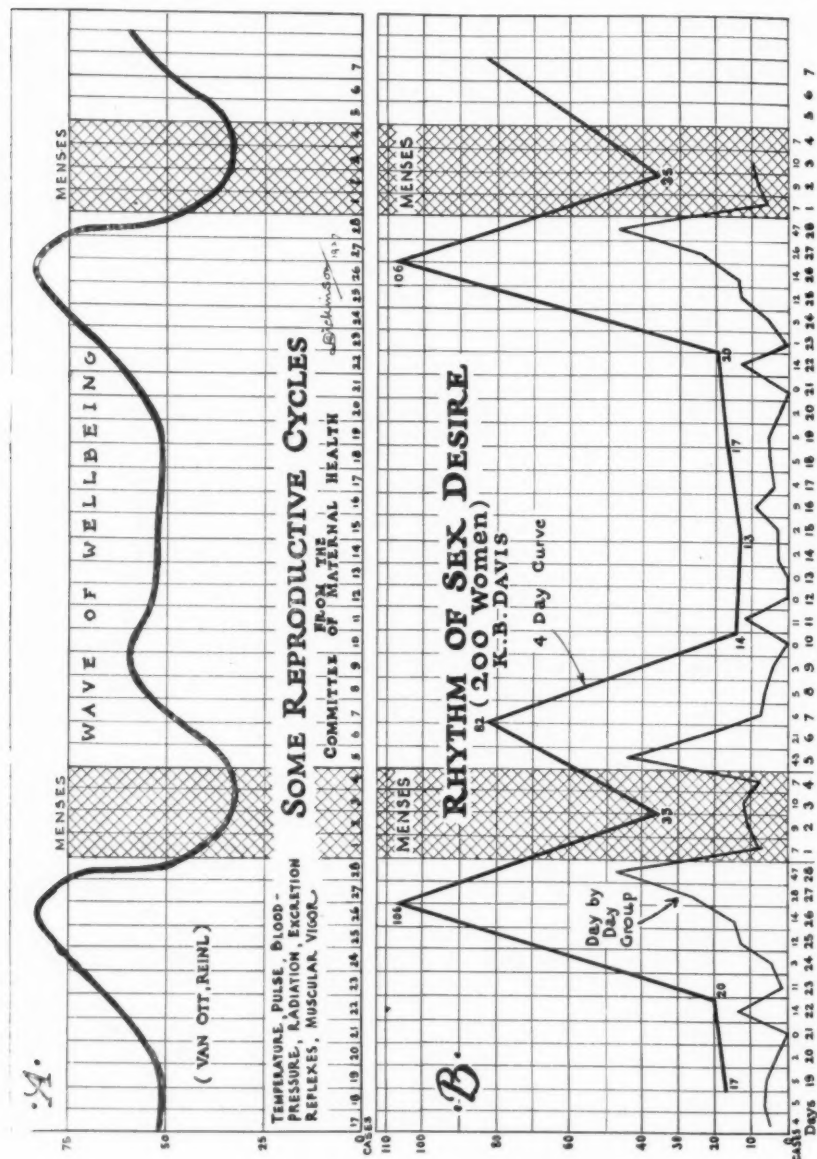


Fig. 1.—The Menstrual Cycle. A, The wave of well-being. B, The rhythm of sex desire.

gradual recovery, which rebounds and drops to normal about the seventh day after menstruation (Reinl). This periodicity is slightly manifest in the male, and recurs in five to six week intervals. Perhaps it is the external evidence of the formation of spermatozooids." It is



said that the simplest evidence to obtain is the temperature curve, and that it is a fair indication of the periodicity which the other tests may be expected to yield.

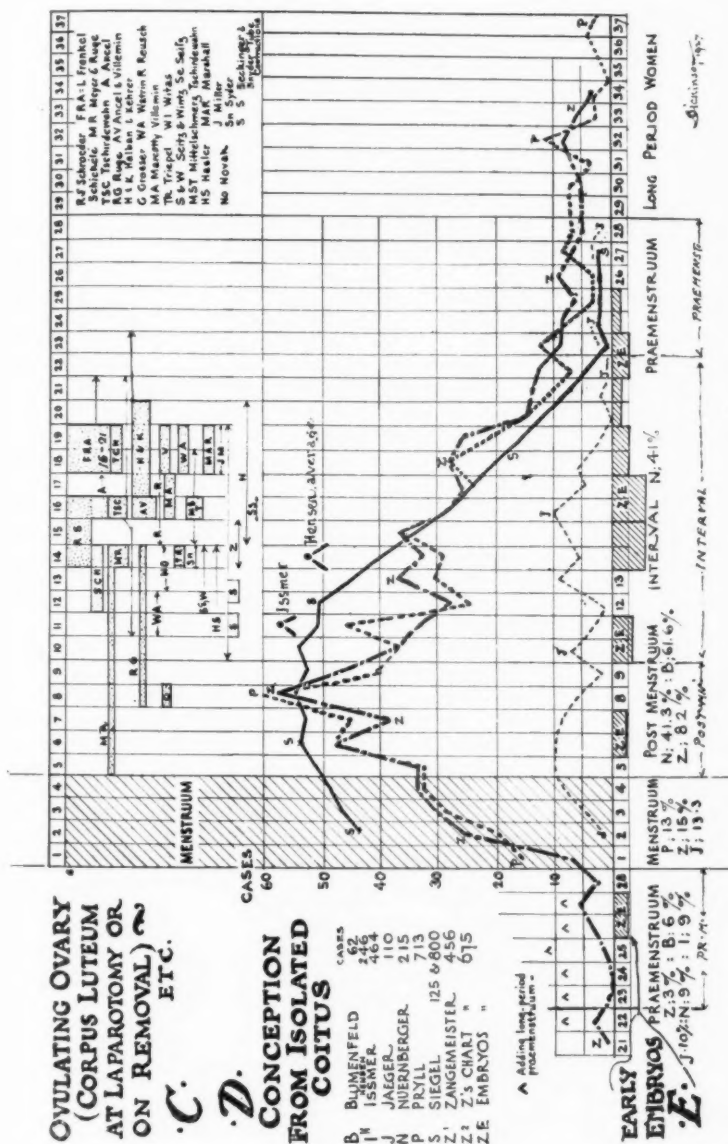


Fig. 2.—The Menstrual Cycle. C, The ovulating ovum. D, Conception from isolated coitus. E, Early embryos.

*The Sex Desire Cycle.*—The second curve in our chart B (in Fig. 1) is adapted from a paper by Dr. Katharine B. Davis. In order to fit our scheme, the points in the Davis graph which are on a dividing line between days have been allotted to the day before and the day after, in rotation, so as to distribute them as fairly as possible. Be-

cause of the occurrence of such reports as "a week before," which pile up on given days unduly, the four-day form of graph was selected as likely to show a clearer grouping. It will be noted that the larger, and also the secondary wave of desire, show a general correspondence

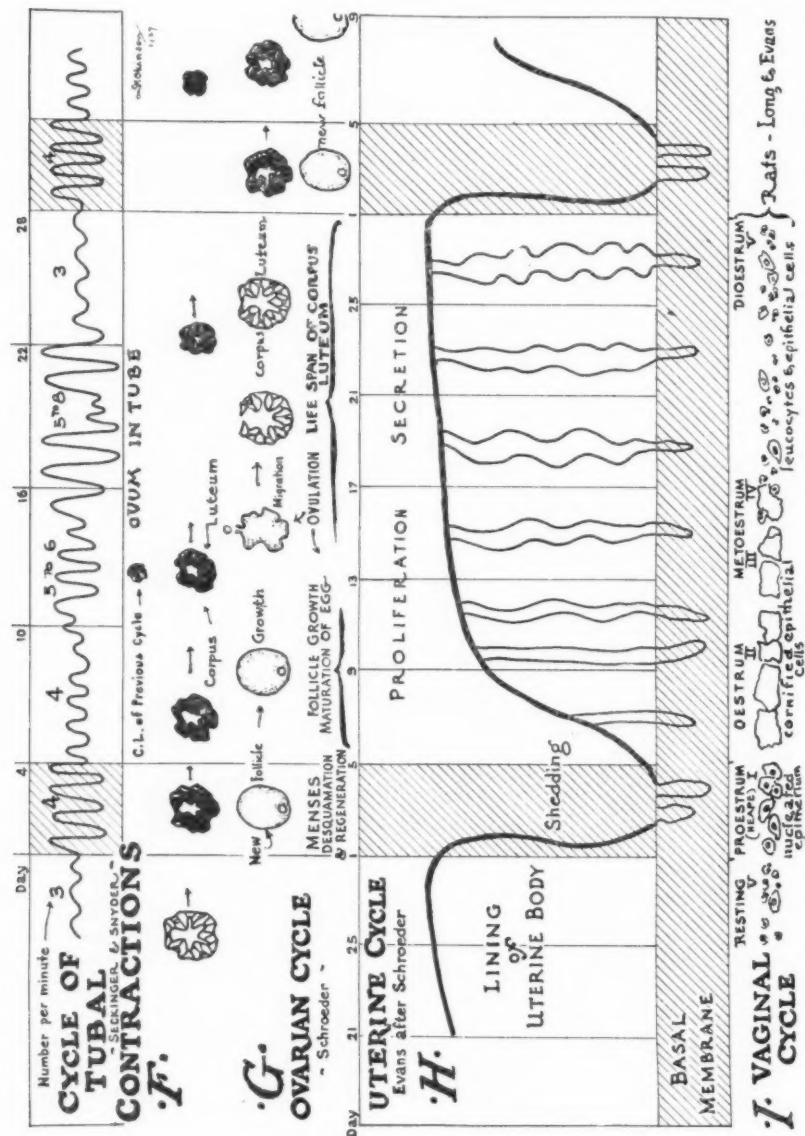


Fig. 3.—The Menstrual Cycle. F, Tubal contractions, G, Ovarian cycle, H, Uterine cycle, I, Vaginal cycle in rats.

with that of well being or physical activities in section A (Fig. 1) and that both of them bear a certain relation to the curve of the development in the lining of the uterus, section G (Fig. 3). It has long been generally accepted as a fact that the time of strongest sex urge in

women, and the sole period of responsiveness in very many women, coincided with the most favorable time for the occurrence of conception, the postmenstrual week. If, however, women in general fit into the plan of these two hundred, this statement must be modified. The group of greatest frequency of desire falls into the period of least likelihood of conception. It is the second high point that does come close to the postmenstrual time when, according to chart *D* (Fig. 2), coitus is most likely to result in pregnancy.

*The Ovulation Cycle.*—The time of rupture of the follicle in its relation to menstruation has been studied in many hundred abdominal operations by a number of gynecologists, such as Schroeder, Ruge, Halban and Fraenkel. Taking the visual evidence of recent escape of the ovum from the ovary, or judging by microscopic sections of the removed corpus luteum, or of the yellow body in ovaries removed at operation, one finds that, whatever its scattering character before that time, testimony tends to accumulate toward the fourteenth to nineteenth days very strikingly, and then suddenly goes blank. The benefit of graphs lies in this appeal of grouped evidence to the eye. The other witnesses are placed on the same chart. Mittelschmerz, with one swollen, tender ovary, (MST), on the eleventh day; Snyder's tube contractions; epithelial changes that correspond in appearance with the linings of tubes in animals as the ovum is found to be passing; Seckinger and Snyder's waves of high contractions in the tube that fit the same type in the animal with the egg going by; and the striking fact that a castration dose irradiating the ovary finds a line of demarcation between the arrest or the nonarrest of the subsequent menstruation (Seitz and Wintz) on the fourteenth day—all these "marshall" themselves in the region on which that doyen of the physiology of reproduction would agree.

The earlier observations based on mere inspection of corpora lutea at operation are said by Ruge and Triepel to be of scant value. "Fresh" or "old" in this connection means nothing, unless the yellow body be cut out and studied microscopically. The error can be from one or two days to two or three weeks. Marcotty in studying corpora lutea even discounts Fraenkel and acclaims Meyer and Ruge and Schroeder as exact because they investigated the uterine mucous membrane in their cases as well as the follicle-corpus-luteum findings, and checked up the two processes against each other. Yet Fraenkel and his associates, Hergesell, Dittler, Tschirdewahn and Derek, have looked into ovarian conditions in 379 laparotomies as shown in Fraenkel's clear summary in the Halban-Seitz *Biologic-Pathologic*. "Inspection of the surface of the ovary alone," he says, "is insufficient to recognize a developing follicle or an old corpus luteum with certainty. It is decisive, however, for judgment on a follicle just

ready to burst or recently opened." The cherry-sized, prominent, red, easily bleeding corpora he classes as one to three days old and these were seen from the eleventh to the twenty-sixth day, the two twenty-sixth day cases being women with thirty-one day periods. "In four week habits the eighteenth and nineteenth days were most constant." "An exact statement of a definite day as a rule for ovulation is false." While he admits his observations were microscopic only, he avers that many of Schroeder's dates are queered by his cases being pathologic. Schroeder's paper covering 100 operations carries great weight, and his chart is very generally copied, here shown slightly modified in sections *G* and *H* (Fig. 3). Meyer and Ruge, at 106 operations, found a high correlation between the endometrium and the corpus luteum, the recent corpus luteum running with the early premenstrual lining, the mature corpus with the later stages, and retrogression about the onset of the menses. Halban and Koehler, in 40 laparotomies, shelled out the yellow body simply (not with the cautery as in Fraenkel's 9 cases). Uterine bleeding of the type of the patients' regular periods came on two to four days later in 92.7 per cent of the cases, with a regular period four weeks later. If the extirpated corpus was dropped into the peritoneal cavity the prompt bleeding did not follow. Ancel and Villemin, on the basis of 27 cases with healthy ovaries, doubt that one can determine a follicle about to rupture, and declare one can only count on the hole of rupture as actually observed.

In castration by the x-ray, Seitz and Wintz declare that, if done before the fourteenth day, no further period appeared in 95 per cent of the cases, whereas if done after this day the next period occurred in 96 per cent. They therefore argue for a single large dose in the first half of the intermenstrual time.

Because spermatozoa are thought by many authors to have a life not over forty-eight hours, and eggs to be fertilizable only a few hours, and as the gap between fruitful intercourse and ovulation runs up to seven or ten days, as shown in sections *C* and *D* (Fig. 2), attention has been drawn to the possibility of rupture of the follicle by coitus. Coitus has this effect in the domestic rabbit and cat and on the ferret, the interval being about ten hours in the rabbit. Triepel differentiates between ordinary or spontaneous ovulation and artificial or coital, and argues ably for the latter. Grosser would make the group three-fold: (1) spontaneous, (2) missed, and (3) artificial, or what I might call coital. In the rabbit orgasm seems necessary (Hammond and Asdell). Grosser places coital ovulation about the eighth day. His "missed" ovulation provides for those eggs that never ripen and burst, as in Corner's monkeys (1924). There is the further possibility,

mentioned by Stockard, of more than one ovulation in the menstrual cycle. Evans suggests extra-cyclic ovulations.

In the matter of late ovulation we may not forget the fertility of the orthodox Jewess who must not have intercourse before the eleventh day from the beginning of the period, though there seems to be some uncertainty about the exact day.

One may modify the words of Hammond and Asdell and say: There is shown (in our charts) "an average probability in the mass, but it is not necessarily true of the individual." Giles shows that the length of the cycle may vary from twenty-one to thirty-five days; therefore the time of ovulation, if all the cases were grouped on the twenty-eighth day cycle, would vary from  $-7$  to  $+7$  from the normal, thereby causing a variation in degree of fertility at different times such as is shown by our chart at sections *C* and *D* (Fig. 2). We shall be obliged to go back to the original records, both of isolated conception and operation-ovulation, and group together, in each, the cases of three- and four- and five-week cycles, to get clearer notions.

*Conception from Isolated Coitus.*—Reports from more than 1000 women are recorded where pregnancies followed single exposures or brief visits of the husband. These have been reviewed and charted by Zangemeister, Pryll and Siegel. The three lists are largely made up from the same material and chiefly from Schlichting, Gossrau, Hecker, and Ahlfeld. Siegel's first paper dealt with some 320 women but his first graph took 125 as being above criticism, while his 800 included all the instances of single or limited coitus he could find in the literature. I have thought best to depict all three main studies, redrawn in section *D* (Fig. 2), in order to show how little they vary in essentials. The Siegel line is much smoother than the other two near it, though constructed partly from the same records, and not exceeding the others enough in numbers to account for some rather marked differences. The height during menstruation should be noted.

Pryll omits Siegel's cases from his chart, and gives graphs of 7 of the 11 authors he draws upon. Four of these 7 resemble the Zangemeister and Pryll lines in our graph and Siegel's chart of his 125 cases, in that there appears a secondary rise between the thirteenth and the eighteenth day, centering on the fifteenth and thus not far from Henson's average of the fourteenth and Jaeger's rise, and the main group of embryo indications. This secondary wave of fruitful cohabitation comes close to the ovulations shown in section *C* (Fig. 2). This group of cohabitations calls only for one to four day life of sperm within the female passages, as against seven to thirteen days with the group represented by the earlier peaks. The striking thing in the *C* and *D* sections (Fig 2), and the chief puzzle in human reproduction thus graphically pictured for the first time, is the gap between the



highest frequency of isolated fruitful coitus and of ovulation according to laparotomy evidence. The explanation that ovulation may be induced by orgasm we have suggested.

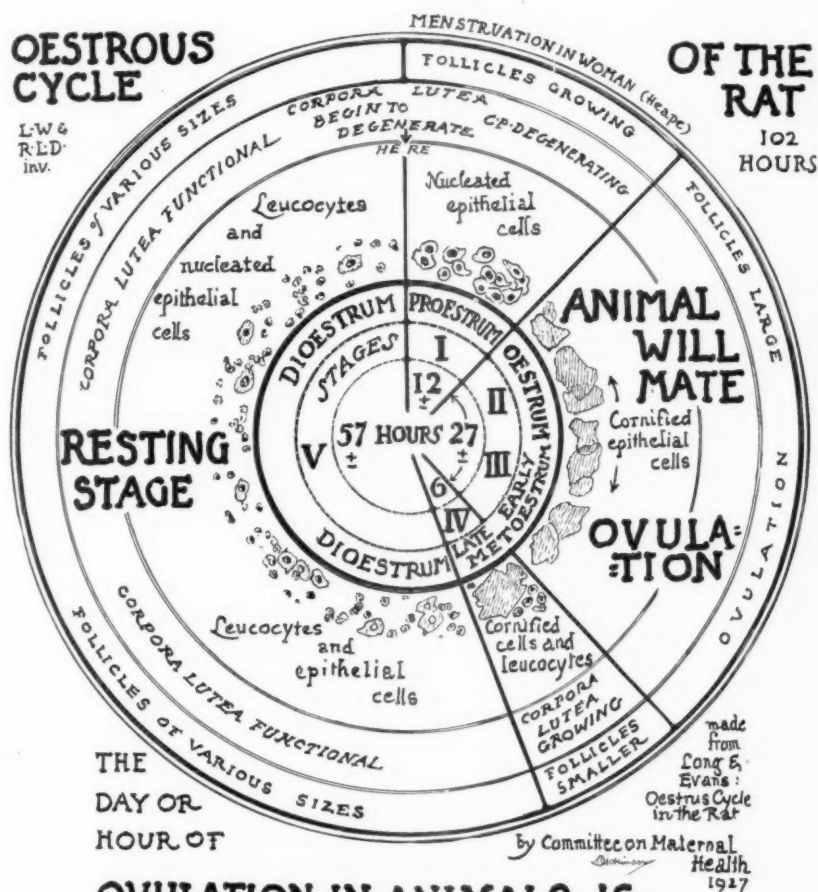
Issmer, drawing his material from the Munich "Frauenklinik," reports on 472 patients giving both date of period and of conception. As pregnancies starting during the period, he lists only 1.5 per cent, and for the premenstrual week 9.07 per cent. The first week takes 37.07, the second week 35.36, or 72.43 per cent in the first half. Jaeger's premenstrual group comprises 10 per cent of his 110 patients, and the menstrual 13.3 per cent. Hensen (quoted in Zweifel) found in 248 cases of known single coitus, that 86 per cent ran in the neighborhood of the fourteenth day.

The Jaeger line is given as an example of the need of large numbers to secure better averages and to show the presence of premenstrual conceptions even in a small series. The embryo grouping derived from estimates of ages of early examples, as shown in the shaded blocks marked "ZE" at the bottom of section *D* (Fig. 2), also runs over into the premenstrual. The terms "premenstruum," "postmenstruum" and "interval" are drawn from various German charts and tests. How fixed they are in custom I do not know. Some German authors specify the whole week when they speak of premenstrual conceptions. The percentages at the bottom of section *D* (Fig. 2) therefore are not always comparable.

There is general agreement on five matters: (1) Conception can occur at any part of the month. (2) There is very marked difference between favorable and unfavorable periods. (3) The week or ten days following menstruation is the time of greatest likelihood of conception. (4) The week preceding menstruation presents the least chance of conception, averaging about 7 per cent, or, in various lists, 3, 6, 9, 9.3, 10 per cent. (5) Conception during menstruation is relatively frequent, about 13 per cent.

The chief surprise, I believe, will be the relatively marked fertility shown to exist during menstruation. In view of the common avoidance of intercourse during the period, the percentages here quoted may indicate a lower capacity for conception than actually exists. The figures on the base of chart *D* (Fig. 2) show 13, 15, 13.3 per cent and to these may be added Ahlfeld's 13.2 per cent in 219 cases. Issmer's were 9.97 for this time, Siegel's still higher. The observation will have this practical outcome, that we shall advise those patients who have no other evident cause for sterility not to neglect coitus during the period, and indeed, to draw the attention of all patients except those with sealed tubes to the possibilities in this nearly forgotten field. Menstrual blood is a particularly favorable medium for persistence of motility of the sperms (Hoehne) and low or brief motil-

ities may take notice. Zangemeister's is the fullest statistical study of fruitful intercourse. Several of the papers listed deal largely with considerations of male or female children resulting from coitus at various parts of the cycle, on the length of pregnancies and the weight of babies and the relation between day of fruitful intercourse and day of menstruation and the date of delivery. We are here concerned only with the matters having to do with a "safe period," and take up elsewhere duration of life in sperms and ova.



**OVULATION IN ANIMALS IS ACCURATELY DEMONSTRATED**  
 by microscopic examination of vaginal cells on smear  
**CAN THE "SAFE PERIOD" IN A GIVEN WOMAN BE SHOWN IN THIS WAY,**  
 and the most favorable time for conception?

Fig. 4.—The Oestrus Cycle of the Rat. (From Long and Evans.)

*Early Embryos.*—Fraenkel has collected, in Liepmann's *Handbuch*, the evidence based on embryos, and lists them between the second and twenty-fourth day, 9 before and 12 after the fifteenth day. Our section *E* (Fig. 2) is made up from Zangemeister. The largest group falls between the fourteenth and sixteenth day as pointing to the day of ovulation. Grosser's studies merit careful consideration.

*Tubal Cycle.*—The lining of the tube is smooth in pigs when the egg is passing. Snyder finds the corresponding state of the epithelium in the human tube at the thirteenth day. As to tubal contractions, the behavior is indicated in section *F* (Fig. 3) of the graph. The tubes are never seen contracting at laparotomies, but found by the fluoroscope, after injection of iodized oil, to be always in regular peristaltic activity. Rubin, when making insufflation tests, now registers the waves graphically on a drum, and recognizes differences at different parts of the interval. When removed at operation, and a section hung in solution, the waves are shown by Seekinger and Snyder to be of differing amplitude, speed and groupings. I have taken these authors' waves and placed them end to end that we may visualize the slow contractions at uniform amplitudes at all times except between the tenth and twenty-second day. Sweep and speed are nearly doubled between the sixteenth and twenty-second days, and the action then falls into groupings. As action of this kind is known to occur in the pig (Seekinger) and the monkey (Corner) where the association of it with the passing of the ovum may be made, it is one more indication of the date of ovulation. Sobotta says the stay of the ovum in the tube is singularly uniform, averaging three days, with no relation to size of animal, length of pregnancy, size of the ovum in mammals, or the development while in the tube. The dog is an exception. "So far as known, fertilization always takes place in the tube," says Corner.

*The Vaginal Cycle.*—In the variety of animals that have been studied since their observations on the guinea pig were brought out by Stockard and Papanicolaou in 1917, the vaginal epithelium is found to undergo alterations which clearly indicate the processes going on in the ovary, and point to the exact time of ovulation. How marked the changes and how great the contrasts may be, as shown by a simple vaginal smear, is to be noted in section *I* (Fig. 3) and in Fig. 4, where we have borrowed from Long and Evans the evidence in the rat. The hope of findings of equal sharpness in the woman has not been borne out by the elaborate (unpublished) studies of Papanicolaou, initiated by our committee, with a considerable number of patients, although he believes he is on the track of important indications. The 11 women recently studied by Jessie King showed no definite cycle. It is evident that many virgins with one-finger, sharp-edged hymens must

take swabbings, and much evidence must accumulate, before any statement can be made. Then we may possibly find indications in the human vagina of a point of high fertility, and one of a nonfertile period, either for laying down general rules or for regulating one individual at a time.

In a personal communication, R. T. Frank, discussing ovarian hormones in the blood, says that the results from the blood of the human female would indicate that throughout sexual life the female sex hormone is circulating in the blood. Approximately ten to twelve days before the next impending menstruation, a sudden rise of the amount of hormone circulating in the blood is noted, this rise persisting until the onset of the flow. We interpret the onset of this increase as corresponding with the rupture of the follicle and the absorption en masse of the follicle fluid, and the continued increase, as the effect of secretion from the corpus luteum. We therefore place the time of ovulation as approximately midway between the onset of two periods which corresponds sufficiently closely with the latest morphologic data.

Correlating these data with the data obtained from animals, it would appear that the most favorable time for conception would follow coitus occurring approximately two weeks before the next expected period. Conversely, the least favorable time for conception should be immediately after menstruation as well as the week preceding the expected menses. Statistic studies, however, would indicate that no "safe period" may occur in the human being. This would signify that either the human spermatozoa survive over a longer period than those of lower animals, or that the human ovum survives longer, or that both of these conditions obtain.

#### SUMMARY

1. There is no time in the month at which conception has not occurred in some women.

2. The premenstrual week constitutes the relatively "safe period," or "low-risk period," when the average chance of pregnancy is less than one in ten.

3. A "safe period" or sterile part of the cycle is present in every woman, but is a matter for individual tests, and such successful tests are not yet effectively transferable from animals. Nor has any series been studied that is made up of adequate case records of women with known "safe periods."

4. The height of fertility belongs to the week or ten days following menstruation.

5. Fertility is relatively high during menstruation. For the four days that make up 14 per cent of the average menstrual cycle, conceptions from isolated coitus have amounted to 13 per cent.

6. Abdominal operations point to ovulation between the fourteenth and nineteenth days from the beginning of the period—rarely thereafter. Coitus may possibly free the ovum earlier.

7. Alterations in rhythm of tubal contractions and in the tube lining point to passage of the ovum subsequent to the above days and up to the twenty-second day.

8. New evidence shows coincidence of maximum sex desire and maximum well-being with minimum chance of conception, in the premenstrual week; also a secondary wave of desire at the time of greatest fertility.

The complete paper, from which this has been condensed, appears in the author's reprints, which may be obtained from the office of the Committee.

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(For discussion see page 836.)

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## BLOOD BILIRUBIN IN ECTOPIC PREGNANCY

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### THEORETICAL CONSIDERATIONS

THE clinical diagnosis of ectopic pregnancy so often proves difficult that a differential laboratory test would be most welcome. Such a test might be expected to show either a biologic phenomenon characteristic of pregnancy, or one diagnostic of intraabdominal hemorrhage.

Relatively little attention has been paid to the fate of the extravasated blood in cases of ectopic pregnancy. Some of the blood may be absorbed from the peritoneal cavity unchanged, just as we assume the course to be when blood transfusions are given intraperitoneally. Some of it undergoes disintegration, with a liberation of the hemoglobin from the red blood cells, followed by a breaking down of the hemoglobin into simpler substances.

In the first volume of his *Archiv*, published in 1847, Virchow<sup>1</sup> mentions finding yellowish-brown crystals in old hemorrhagic extravasations in various parts of the body. Rokitsansky had found these crystals previously but had failed to recognize their nature. Virchow realized that he was dealing with a product of changed blood pigment, hematoidin. This hematoidin has since been proved<sup>2, 3</sup> to be identical with bilirubin, the yellowish pigment normally present in human blood serum and bile.

Since Virchow's time, so many observations have been reported of local bilirubin formation in blood extravasations, that the process is generally recognized as one which occurs in every hematoma, and with surprising rapidity. Froin,<sup>4</sup> in 1906, reported the finding of bilirubin in 53 of 178 hemorrhagic fluids from the peritoneum, pleura, and cerebrospinal space. Guillain and Troisier<sup>5</sup> found bilirubin in the chest fluid from hemothorax cases, and in the spinal fluid from cases of cerebral hemorrhage. Van den Bergh and Snapper<sup>6</sup> found in hemorrhagic fluids, always a much greater concentration of bilirubin than was present in the patient's blood. In some hematomas, Van den Bergh<sup>7</sup> found bilirubin in as great a concentration as it occurs in bile. Others, notably Blankenhorn,<sup>8</sup> report similar findings.

In 1914, Van den Bergh<sup>6</sup> attacked the problem experimentally by injecting hemoglobin solution under the scalp of dogs. Two or three days later, the aspirated fluid contained bilirubin which, however, never appeared in the peripheral blood. Whipple and Hooper, in 1916<sup>9</sup> injected hemoglobin into the pleural or peritoneal cavities of dogs, and found that a prompt transformation into bilirubin occurred. This was manifest at the end of eight hours, and within twenty-four hours, a considerable amount of bilirubin had been formed. Leschke<sup>10</sup> found bilirubin in human spinal fluid within a few days after blood had been injected into the cerebrospinal space.

From the above-quoted observations, it is safe to infer that bilirubin may be formed in the intraperitoneal blood extravasations of cases

of ectopic pregnancy, and sometimes in large amounts. It is of great physiologic and clinical interest to know what becomes of this bilirubin, and of the unchanged hemoglobin, as well as the intermediate substance, hematin, that accompanies them. Does it remain in situ and form the crystals which Virchow observed? Is it absorbed and if so, rapidly enough to stain the body fluids and tissues to an abnormal degree, even to cause jaundice? How promptly is it excreted?

Some months ago we examined a specimen of bloody pericardial fluid removed from a patient with Gaucher's disease who had a large pericardial effusion. The fluid contained a very large amount of bilirubin yet the patient's blood bilirubin was normal.

Van der Bergh and Snapper<sup>7</sup> reported several cases illustrating this phenomenon. One patient had a traumatic hemothorax. The joint fluid contained bilirubin in a concentration of one part to 2,300,—as great as it is found in bile. The peripheral blood of this patient showed but a trace of bilirubin. Another patient had a pleural neoplasm. The bloody pleural fluid contained bilirubin, one part to 30,000, while the peripheral blood contained one part to 360,000 (normal amount). Blankenhorn<sup>8</sup> studied a case of traumatic hemothorax resulting from a stab wound four days before admission to the hospital. The plasma from the bloody pleural effusion contained a very large amount of bilirubin, whereas the patient's peripheral blood contained practically none. Rich<sup>3</sup> examined the fluid from a large omental cyst, which he found to contain an enormous amount of bilirubin, whereas the patient's blood had an unusually low bilirubin content. In cases such as these, in which high concentrations of bilirubin have been formed in hemorrhagic fluids, there appears to have been little absorption of the pigment, rather, a local storage of it. Blankenhorn<sup>8</sup> believes that this occurs because bilirubin is held "adsorbed" in the plasma of the hemorrhagic fluid to a remarkable degree. He demonstrated that there was no diffusion of bilirubin from such plasma contained in a collodion sack, into the surrounding water. "Some unknown change in the plasma occurs, to heighten its adsorptive power for bile pigment when blood escapes into a serous cavity in a healthy person."

The rate of absorption of hemoglobin and bilirubin from the intraperitoneal blood extravasations of ectopic pregnancy cases is not known. Direct observation is lacking, conditions associated with other hemorrhagic extravasations are not strictly analogous, nor has the experimental work thus far reported, reproduced the conditions which obtain in patients with ectopic pregnancy.

Tarchanoff,<sup>11, 12</sup> in 1874, demonstrated in dogs with biliary fistulae, that there was a prompt increase in bile pigment excretion after the intravenous injection of hemoglobin or bilirubin solutions. Stadelmann<sup>13</sup> confirmed these results. He found that the increased pigment excretion began at once after the bilirubin injections and continued for five hours. Following hemoglobin injection, the bile pigment output began to increase in three or four hours, and the increase lasted twenty-four hours. Stadelmann<sup>14</sup> obtained almost as rapid bile pigment excretion after intraperitoneal injections of hemoglobin, as he had after intravenous injections. The conclusions from these classical experiments form the basis of our present conception, recently formulated by Rich<sup>15</sup>: "If the quantity of plasma bilirubin be temporarily increased by any means which does not at the same time impair or

overstrain the excretory function of the liver, the liver will promptly excrete the excess of pigment until the normal level of plasma bilirubin has been reached again."

#### PREVIOUS OBSERVATIONS WITH ECTOPIC CASES

In 1884, Dick<sup>16</sup> reported 3 cases which presented the clinical picture of ruptured ectopic pregnancy with severe intraperitoneal hemorrhage, associated with an icteric appearance of skin and conjunctiva. In one case, posterior colpotomy proved the diagnosis of intraperitoneal hemorrhage. In each case the urine contained an abundance of urobilin, but no bilirubin. Dick considered the urobilinuria to be the result of intraperitoneal blood disintegration, and the cause of the icterus.

Schiller and Ornstein<sup>17</sup> recently reported a study of urobilinogenuria in normal and in ectopic pregnancy, in a large series of cases. They obtained positive results in 10 per cent of suspected ectopics and in 80 per cent of a series of 63 proved ectopic pregnancy cases. In analyzing their material, they concluded that urobilinogenuria is found in ectopic pregnancy when active bleeding is going on, or has occurred within two or three days.

In 1909, Lodewijks<sup>18</sup> reported a case of ruptured ectopic pregnancy at four months, associated with anemia and icterus. No blood or urine examinations were reported.

Schottmüller,<sup>19</sup> in 1914, reported four cases of ectopic pregnancy associated with icterus, in which hematinemia was demonstrated (by Schumm) on spectroscopic examination of the blood serum. The first case presented the clinical features of a ruptured ectopic, with marked anemia and a yellowish coloration of the skin. The blood serum was yellower than normal, and contained much hematin. Hemoglobinuria and methemoglobinuria occurred also. This patient recovered without operation. A second patient also had a ruptured ectopic, with severe anemia and slight icterus of the conjunctiva. Hematinemia was demonstrated. Operation verified the diagnosis. Two other cases, with history and findings diagnostic of a simple adnexal tumor, were observed to have an icteric appearance. On spectroscopic examination of the serum, hematin was reported, whereupon both cases were diagnosed as ectopic pregnancy and cited to show that pigmentation of the conjunctiva and hematinemia may occur in ectopic pregnancy even when there has been no demonstrable intraperitoneal hemorrhage. Both patients got well without operation, so that we have no further proof of the diagnosis. Schumm<sup>20</sup> who had done the spectroscopic work on the sera of these patients, later examined the sera of five other patients with ectopic pregnancy and could find hematin in none.

In 1920, Norris<sup>21</sup> reported two patients with ruptured ectopic pregnancy who had observed themselves to become jaundiced, and who looked icteric. The diagnoses were verified at operation, about a pint of blood being found in the peritoneal cavity of each case. On the third or fourth day after operation, the icteric appearance was no longer observed. The clinical determination of transient jaundice is notoriously uncertain, because pallor exaggerates the normal pigmentation of the skin. In such cases, the diagnosis of jaundice should be substantiated by a quantitative examination of the blood plasma for bilirubin by some reasonably accurate method. No examinations were performed in these cases. A third patient with ectopic pregnancy reported in the same article had no jaundice, but bilirubin was demonstrated in blood serum and urine by the Gmelin test. Bilirubinuria in hemolytic jaundice cases is so exceptional (hence the term acholuric jaundice) that it is possible in this case it was due to some coincidental liver disturbance.

In a paper on the icterus index of the blood serum, in 1924, Dr. Alice Bernheim<sup>22</sup> reported the finding of high values in the peripheral blood of two cases of ectopic pregnancy. This so-called icterus index is an expression of the color intensity of a

specimen of serum as compared to that of a standard. In the above-mentioned work, a 1:10,000 solution of potassium bichromate was used as standard, with a Boek-Benedict colorimeter (method of Meulengracht,<sup>23</sup> modified by Maue<sup>24</sup>). The high color of the sera of these ectopic pregnancy cases was certainly suggestive, and stimulated investigation to determine whether such findings were constant, and characteristic of this condition. Dr. Kross, of the Mount Sinai Hospital gynecological staff, has examined the blood of cases of ectopic pregnancy by the above method and considers it a valuable diagnostic test. In April, 1925, Hawks<sup>25</sup> reported the experience with the icterus index test in ectopic pregnancy cases at the New York Hospital. "The icteric index has been taken in a few cases lately and is principally of negative value. A low or normal reading in the presence of a mass, reasonably rules out blood-clots. A high reading with a good picture otherwise, may be of slight positive value."

The color of human blood serum is due chiefly to the yellow pigment, bilirubin, which is formed within the body as a result of the breaking down of hemoglobin. Hemolyzed or cloudy specimens of serum must, of course, be rigidly excluded, if color intensity of the serum is to be used as an index of its bilirubin content. Hemolysis is the great pitfall in icterus index determinations, for the slightest trace of hemolysis changes both the quality and intensity of the color of the serum. Traces of hemolysis are readily recognized by the experienced observer, from the slight reddish tint imparted to the serum by the dissolved hemoglobin. If in doubt, one can immediately identify oxyhemoglobin, when present, by means of a small hand spectroscope, as Meulengracht<sup>23</sup> advised. The two characteristic absorption bands of oxyhemoglobin are unmistakable. If carrots are eaten in excess, the yellow vegetable pigment, carotin<sup>26</sup> may color the blood serum much more deeply than normal. Perfectly clear and nonhemolyzed sera from relatively normal patients on a general diet may have the same color (icterus index) and yet vary considerably in bilirubin content (as shown by the Van den Bergh test). Evidently the yellow color of the serum with less bilirubin has been augmented by the presence of other yellow pigment. The presence of this variable amount of unidentified yellow pigment in human blood serum is an uncontrollable source of error in bilirubin estimations by the icterus index test.<sup>27, 28</sup> In cases of jaundice, this factor is dwarfed into insignificance by the relatively large amounts of bilirubin present, but with the lower bilirubin concentrations, it is a factor not to be disregarded.

The recent article of Bang<sup>29</sup> on bilirubinemia should be mentioned, because three cases of ectopic pregnancy are included in his series. Blood serum was examined by the Gmelin-Sunde method. The serum is layered over nitric acid containing a little sodium nitrite, whereupon a whitish contact zone of coagulated albumin develops. If a bluish-green ring appears, within this zone, it is taken to indicate the presence of bilirubin, and the more promptly it appears, the more bilirubin is thought to be present. The formation of the green ring within a half hour is considered to indicate an abnormal bilirubinemia. This was found in every one of ten cases of acute appendicitis, in seven out of nine cases of chronic appendicitis, in four out of sixteen patients with salpingitis, in each of fourteen cases of fracture or contusion, in each of three cases of ectopic pregnancy, and in 37 per cent of a series of patients with miscellaneous maladies. Clinically, it was certainly not a specific test. Chemically it is not specific because lutein substances in the serum may cause the same green ring.<sup>27</sup> It is not a sensitive test, for it does not demonstrate the bilirubinemia which we know to occur normally, and which is easily demonstrated by more delicate methods. (Van den Bergh.<sup>27</sup>)

#### ORIGINAL INVESTIGATIONS (METHOD)

In 1925, at the suggestion of Dr. S. H. Geist, we began to examine the blood sera of patients with ectopic pregnancy by the quantitative

method of Van den Bergh,<sup>27</sup> which is a specific, sensitive test for bilirubin.

A half c.c. of serum is required for the test. To it is added 1 c.c. of absolute alcohol, which causes a precipitation of serum proteins. After centrifuging, the clear supernatant fluid is poured off, and to it is added  $\frac{1}{4}$  c.c. of Ehrlich's diazo reagent. A violaceous color (azo-bilirubin compound) results, its intensity dependent upon the amount of bilirubin present. This color is compared with that produced by the addition of the diazo reagent to a standardized solution of pure bilirubin (isolated by one of us from human bile drainage). The standard must be freshly prepared each time. A simple dilution colorimeter is used, consisting of two long graduated 10 c.c. tubes and a ground glass background. The results are expressed in mg. of bilirubin per 100 c.c.

With the Van den Bergh test, some bilirubin is carried down with the protein precipitate, by adsorption. In normal sera this is an insignificant loss, but in obstructive jaundice cases it may be considerable, and result in quantitative estimations which are too low. In hemolytic jaundice, however, the percentage of bilirubin loss with the protein precipitate is the same as occurs normally. Van den Bergh observed this fact, which has been confirmed by many subsequent observers, including Feigl and Querner,<sup>30</sup> Lepehne,<sup>31</sup> Meulengracht,<sup>23</sup> and Thannhauser and Andersen.<sup>32</sup> For the determination of blood bilirubin values in conditions associated with blood destruction (such as ectopic pregnancy) the Van den Bergh method is therefore ideally suitable.

In addition to carrying out bilirubin determinations by the Van den Bergh method, we examined all nonhemolyzed sera by a modified icterus index method similar to that of Meulengracht.<sup>23</sup> A small dilution colorimeter was used, similar to the Sahli hemoglobinometer, and 1 c.c. of the patient's serum was diluted to match Kuttner's permanent standard. This standard reproduces the color of a solution of pure bilirubin of definite concentration, so that the color intensity of the serum specimen which has been diluted to match it, is read off directly as the number of mg. of bilirubin per 100 c.c. that would produce that color intensity. This is not the actual bilirubin content of the serum, but the amount it would contain, if the yellow color were produced by the bilirubin alone. The values so obtained are readily compared with those from the specific bilirubin test (of Van den Bergh) applied to the same sera, demonstrating (as mentioned previously) the considerable, variable quantities of yellow pigment other than bilirubin, that may occur in normal human sera.

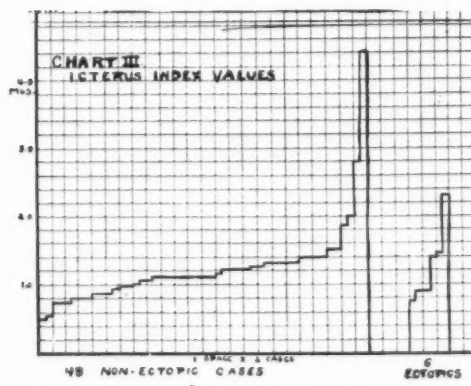
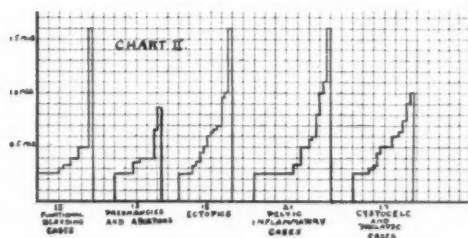
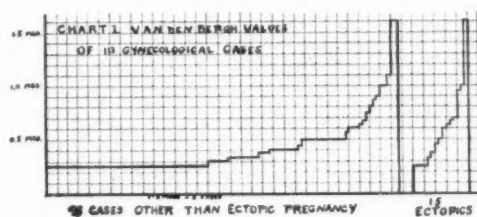
The specimens of blood were taken from one of the peripheral veins, the same as for the Wassermann test. There was no constant relationship to meals, because in the cases of suspected ectopic pregnancy, the blood specimens were taken at the time of admission to the hospital.

The "normal" range of blood bilirubin values found by Van den Bergh, 0.25 to 0.5 mg. per 100 c.c., is considered too low by a number of other workers, notably Botzian,<sup>33</sup> Mandelbaum,<sup>34</sup> Green,<sup>35</sup> and Förster and Förstner.<sup>36</sup> It was therefore necessary for us, in order properly to evaluate our results with the ectopic cases, to perform the same examinations on the sera of a control group of other gynecologic patients. This we did routinely in a series of 130 consecutive admissions to the gynecologic service. Of this control group, in only 98 were the diagnoses satisfactorily established, and the determinations from these only, will be considered here. Up to the present we have examined, before operation, blood serum specimens from 15 cases of ectopic pregnancy, all tubal, each verified by operation and subsequent pathologic examination. The clinical history and operative findings of each ectopic pregnancy case are briefly given below, together with the blood bilirubin values.



## RESULTS

Our results are best shown graphically, by means of three charts. In Chart I, the bilirubin (Van den Bergh) values of our 15 ectopics are plotted beside those of the other 98 gynecologic cases. The number of cases is represented by the abscissae, and the mg. of bilirubin by ordinates. In Chart II, the bilirubin (VDB) values of the ectopic group may be compared with those of other groups represented in



the 98 control cases. In Chart III, the icterus index values of 6 ectopics are plotted beside those of 48 other gynecologic patients. Because of hemolysis, the sera suitable for the icterus index test were relatively few. In some ectopic cases, several preoperative bilirubin determinations were made, sometimes with different results. We might have plotted the mean of the several observations in such a case, but chose instead to use the highest value.

It is apparent from a glance at these charts that ectopic pregnancy cases cannot be identified by their blood bilirubin values. High values

are found in ectopics and in nonectopics, and in about the same proportion. Why there was hyperbilirubinemia in some of our control cases, in the absence of biliary, hepatic, or hemolytic disease, we do not know. Such cases presented no apparent clinical or pathologic features in common. Some of them probably belong to the group designated by Van den Bergh<sup>27</sup> as "physiologic hyperbilirubinemia," but they were more frequent than in his series, so that our findings agreed with those of the other workers previously referred to.<sup>33-37</sup> A summary of the clinical features of each control case with a blood bilirubin value above 0.6 mg. per 100 c.c., is given below.

Of the ectopics, Case 7 is of particular interest. This patient came into the hospital for the repair of a cystoectocoele. An ovarian cyst had been felt in the routine examination, but there were no symptoms suggestive of extrauterine pregnancy. Her routine preoperative blood examination revealed a high bilirubin content (1.6 mg. per 100 c.c. by the Van den Bergh test). Following the plastic operation, laparotomy, undertaken to effect ventrofixation of the uterus, revealed old blood in the abdomen, the left tube being the seat of a pregnancy. The coincidence in this case, of hyperbilirubinemia and old blood in the pelvis, made it tempting to reason *post hoc, ergo propter hoc*, and ascribe the hyperbilirubinemia to the presence of the extravasation. A critical consideration of our other cases, however, brings out these facts:

1. An equally high figure was obtained in a pelvic inflammatory case, and in a patient with functional metrorrhagia.
2. The remaining 14 ectopics had no higher values than the inflammatory cases, or the cystoecoele and prolapse cases.
3. The two unruptured ectopics (Cases 10 and 11) with no free blood, had elevated values, whereas a number of cases with old blood in the pelvis had low values (Cases 2, 4, 12, 13).

Of the control groups, the metrorrhagias, the pregnancies and abortions, and the pelvic inflammatory cases at times present clinical pictures difficult to distinguish from ectopic pregnancy; in fact, a few of these cases were so interpreted and the patients operated upon. Some of the confusing cases had low bilirubin values; a few had elevated values. One of these was especially interesting. The patient was a woman thirty-two years old who complained of pain in the right lower quadrant of the abdomen for two weeks. She had passed the time of her last menstrual period due three weeks before, since which time she had been spotting, and complained of pain in the abdomen. On examination, the cervix was soft and the uterus enlarged to the size of a six weeks' gravidity; the right adnexa felt doughy. The blood bilirubin, by the Van den Bergh method, was found to be 0.87 mg., a high figure. She was operated upon four days

later with a preoperative diagnosis of ectopic pregnancy. At operation, right ovarian and parovarian cysts were found. The tubes were normal and four days after operation, she expelled from her uterus a normal fetus.

It is interesting to notice that the last patient of our series (Case 15) was found clinically to have an icteric appearance, but her blood serum was quite pale, and poor in bilirubin, as shown by both icterus index and Van den Bergh tests. This exemplifies the fact previously referred to, that anemia accentuates the normal pigmentation of the skin, and may give a deceptive impression of jaundice.

#### SUMMARY

1. There is probably a local formation of bilirubin from hemoglobin in the hemorrhagic extravasations of some cases of ectopic pregnancy.
2. It has not been determined how quickly this bilirubin is formed, or how rapidly it is absorbed.
3. The normal liver promptly removes any excess of bilirubin from the circulating blood, by excreting it into the biliary passages.
4. In cases of ruptured ectopic pregnancy, icterus may be simulated because of the anemia.
5. Hyperbilirubinemia, in the absence of biliary, hepatic, or hemolytic disease, is not infrequent.
6. Blood bilirubin values are no different in ectopic pregnancy cases than in other gynecologic patients.

#### CONCLUSION

Ectopic pregnancy cannot be diagnosed by determinations of the bilirubin concentration of the peripheral blood.

#### CLINICAL HISTORIES OF ECTOPIC CASES

CASE 1.—Admitted 10/23/25. The patient had her last regular menstrual period nine weeks before admission. After five weeks' amenorrhea, profuse bleeding began, then sharp pains in the right lower quadrant. She fainted on the third day, after which the pain subsided but both pain and bleeding persisted for the month before admission. On examination, a cystic mass was felt to the left of the uterus in the culdesac.

10/14/25 Blood bilirubin (Van den Bergh) 1.0 mg. Direct VDB slightly positive, delayed.

10/15/25 Blood bilirubin (VDB) 0.5 mg.

10/15/25 At operation, there was a small amount of clotted blood in the culdesac, and an orange-sized cyst of the right ovary. The right tube showed a thickening near its fimbriated end (tubal pregnancy).

CASE 2.—Admitted 9/30/25. Patient's husband had a Neisserian infection in 1920. She had had irregular bleeding associated with lower abdominal pain, vomiting, and faintness for a week preceding admission. On examination, there were

signs of pelvic peritonitis, but no pelvic mass was felt. No operation was performed.

10/21/25 Readmission. Four days before right lower quadrant pain and faintness returned and the patient complained of weakness. On examination, in addition to previous findings, there was now a very tender mass to the right of the uterus and posteriorly.

10/21/25 Aspiration of the culdesac; a bloody froth was obtained.

10/23/25 Blood bilirubin (VDB) 0.5 mg.

10/26/25 At operation, blood clots were found on the left side of the pelvis. The uterus was enlarged to the size of seven weeks' gravidity and felt soft. On the right side was a mass the size of a large orange consisting mostly of blood clot and edematous broad ligament (ectopic gestation).

CASE 3.—12/12/25. Private patient of Dr. X., ruptured tubal pregnancy. Blood bilirubin (VDB) 0.37 mg.

CASE 4.—Admitted 2/26/26 complaining of menorrhagia, suprapubic pain, and burning urination for two weeks. On examination, a cystic right adnexal mass was felt.

3/24/26 Patient was discharged.

Diagnosis: Adnexitis with pelvic peritonitis.

Readmitted eight days later with persistent vaginal bleeding and pain in the right lower quadrant. A cystic mass was still felt in the right adnexal region.

3/24/26 Blood bilirubin (VDB) 0.33 mg.

3/25/26 At operation, there was a right tubal abortion with a moderate amount of dark blood in the pelvis.

CASE 5.—Admitted 3/23/26. Patient had experienced pain in the left lower quadrant for a month. It was mild until three days before admission when she was seized with severe abdominal cramps and fainted. On the day of admission, the griping pains returned. Examination revealed on the left side of the pelvis a very tender, semicystic tumor.

3/25/26 Blood bilirubin (VDB) 0.5 mg.; later 0.7 mg.

3/25/26 11:30 P.M. sudden agonizing abdominal pain, followed by marked weakness.

3/25/26 At operation, there was found a left tubal pregnancy with hemorrhage into the tube, extending through its abdominal ostium into the pelvis where there was about a pint of free and clotted blood.

CASE 6.—Admitted 6/30/26. Last menstrual period started 5/28/26. Two weeks later, the patient noticed spotting and lower abdominal pain, more on the left side. The pain became severe on the night preceding admission. Examination revealed a boggy left adnexal mass.

7/1/26 Blood bilirubin (VDB) 0.68 mg.; ieterus index 1.4 mg.

7/1/26 Operation. There were many blood clots in the lower abdomen. The left tube was pregnant, with a rupture on the posterior wall.

CASE 7.—History given previously. Cystoectocoele with palpable ovarian mass.

Blood bilirubin (VDB) 1.6 mg. Direct (VDB) faintly positive. Ieterus index 2.3 mg.

CASE 8.—Admitted 8/8/26. Patient had her last menstrual period five weeks before admission. She had abdominal cramps for a week, first localizing in the left lower quadrant of the abdomen on the day of admission. She was admitted in shock.

8/8/26 Blood bilirubin (VDB) 0.25 mg. Ieterus index 1.7 (slight hemolysis).

8/8/26 At operation much free blood, with large clots, was found in the abdomen. There was a rupture of the left tube near its distal end. A fetus of two months' size lay free.

CASE 9.—Admitted 8/27/26. Since June, the patient had been menstruating irregularly, and complained of abdominal discomfort. She thought she was pregnant until July 27 when she had labor pains and a hemorrhage. Nine days later bleeding started again. After an interval of eleven days, a feeling of pelvic pressure was experienced which became actually painful two days before admission. On examination, patient looked anemic and sick. There was a soft cystic, slightly tender mass behind and to the left of the uterus.

8/28/26 Blood bilirubin (VDB) 0.45 mg.; icterus index 0.9 mg.

8/28/26 At operation, much free blood was found in the abdomen, and a ruptured left tubal pregnancy.

CASE 10.—Admitted 9/15/26. The last normal menstrual period started July 3. On August 4, when five days overdue, patient felt pain in the left lower quadrant of the abdomen. On August 27, pain was again experienced and patient began to bleed. Pain and bleeding persisted for the eighteen days preceding admission. On examination, there were signs of peritoneal irritation in the left lower quadrant and a tender boggy mass in the left adnexal region.

9/15/26 Blood bilirubin (VDB) 0.63 mg.; icterus index 1.45 mg.

9/15/26 At operation *no* free blood was found in the abdomen. The left tube was the seat of a pregnancy the size of a fist.

CASE 11.—Readmitted 9/28/26. *Interval Note:* Discharged two weeks previously, the patient still had cramps in the right lower quadrant of the abdomen, and vaginal bleeding. She had lost much blood and felt very weak. Examination revealed a right adnexal mass the size of a hen's egg.

10/2/26 Blood bilirubin (VDB) 0.95 mg.

10/2/26 At operation, there was *no* free blood in the peritoneal cavity. The right tube was irregularly enlarged, blue, and contained old blood clots.

CASE 12.—Admitted 10/8/26. Patient's last regular period started August 17. On September 14 when the next period was expected, she spotted a little. She took pills to cause bleeding and bled profusely the next day. Two days later there was a severe hemorrhage, and the patient felt dizzy on attempting to get out of bed. Irregular bleeding persisted with cramp-like pains in the lower abdomen, more on the left side. There was some fever and pain in the right shoulder. Patient fainted three times before admission. On examination, there was a tender cystic mass in the right adnexal region extending up almost to the iliac crest. Icterus index, 0.9 mg.

10/9/26 Blood bilirubin (VDB) 0.25 mg.

10/9/26 At operation, much dark, tarry blood was found in the pelvis. There had been a right tubal abortion.

CASE 13.—Admitted 11/4/26. Patient had never been gravid, though married fifteen years. Many years ago, she was twice operated upon for "abdominal inflammation." Her last regular menstrual period started September 1. She missed the October period, then ten days later she was seized with severe lower abdominal pain, vomited, and began to bleed vaginally. She fainted on trying to get out of bed on the second day after the onset of the pain. Metrorrhagia continued to the time of admission. On examination, she showed moderate pallor. There was a tender irregular doughy mass on the right side of the pelvis, and the left adnexa were thickened.

11/25/26 Blood bilirubin (VDB) 0.6 mg.

11/25/26 Operation. The abdomen was full of blood. The right tube had tube was thickened and adherent.

CASE 14.—Readmitted, 11/25/26. Patient had been in the ward a week previously, with abdominal pain and irregular bleeding; considered to be an in-



flammatory case. On the day of readmission, she had been examined by her doctor, following which she experienced severe lower abdominal pain, and fainted. Pain, weakness and "spotting" continued. On admission, she was very pale, with rapid pulse and tender distended abdomen.

11/25/27 Blood bilirubin (VDB) 0.6 mg.

11/25/27 Operation. The abdomen was full of blood. The right tube had ruptured and was bleeding freely in its isthmie portion. A two and a half month's fetus lay free in the abdominal cavity.

CASE 15.—Admitted 1/27/27. Patient had been anemic for many years. She had no children, but had had two abortions, the last one seven years ago. She had been bleeding irregularly since her November period. Twenty-four hours before admission to the hospital, she began to have severe abdominal pain and felt faint. She was found to be acutely ill; she was pale, with icteric tint of the skin. There was marked tenderness, and a sense of resistance in the left vaginal fornix, and a soft bulge of the culdesac.

1/27/27 Blood bilirubin (VDB) 0.25 mg.; icteric index, 0.7 mg.

1/27/27 At operation, 600 to 800 c.c. of free blood were found, together with a large quantity of clots. There was an hematocele of the left tube, with a rupture at the fimbriated end. The right tube was also the seat of an hematocele.

#### CONTROL CASES WITH HIGH BILIRUBIN VALUES

Y. S.—VDB. 0.67 mg.—Incomplete abortion.

J. W.—VDB. 0.63 mg.—Prolapse. Plastic operation and ventrofixation were done. The pelvic organs were atrophic.

A. H.—VDB. 0.75 mg.—Prolapse. Laparotomy revealed normal tubes and ovaries.

S. N.—VDB. 0.87 mg.—History given previously. Pregnancy with ovarian and parovarian cysts (operated upon as a suspected ectopic).

D. M.—VDB. 0.8 mg.—"G" adnexitis with pelvic peritonitis.

B. L.—VDB. 0.9 mg.—A case of prolapse. At operation, adnexa were found normal.

G. P.—VDB. 1.0 mg.—Cystocele. A plastic operation was done, but no laparotomy.

R. K.—VDB. 1.0 mg.—Adherent retroflexion with chronic salpingitis. (One tube removed, pathologic report "chronic salpingitis.")

N. P.—VDB. 1.1 mg.—Postabortive pelvic exudate with local peritonitis.

H. G.—VDB. 1.6 mg.—A case of "G" urethritis, endocervitis and salpingitis. Admitted with a temperature of 103.6° F. and signs of pelvic peritonitis. No operation. Symptoms subsided with rest in bed.

Follow-up note: Patient completely well.

Note: The blood bilirubin values of this, and of the following patient, were equal to the highest ectopic value.

L. C.—VDB. 1.6 mg.—Chief complaint was metrorrhagia for three months.

Icterus index—4.4 mg.—On examination, the uterus was slightly enlarged. Adnexa were negative. No jaundice visible. Curettage was done. Pathologic report: Endometrium with small areas of exudate.

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206 WEST EIGHTY-SIXTH STREET.

## BACKACHE FROM AN OBSTETRIC AND GYNECOLOGIC STANDPOINT

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SO FREQUENTLY do patients consult the gynecologist or obstetrician for backache among other complaints as to make this subject interesting for investigation. Accordingly, all cases seen from October 1, 1924, to September 1, 1926, were tabulated. During this period 943 consecutive patients were seen. Of these 243 or 24.3 per cent complained of backache alone or in conjunction with other complaints, leaving 700 patients out of the total number of 943 who did not complain. Of these 285 (30.3 per cent) had never been pregnant, 24 (2.5 per cent) had had one or more miscarriages, but no full-term pregnancies, 345 (36.5 per cent) had had one or more babies, while 46 (4.9 per cent) pregnant at the time of examination were given supportive corsets and continued through the pregnancy and puerperium without difficulty. Of the 243 patients who complained of backache 42 (4.5 per cent) had never been pregnant, 163 (17.2 per cent) had had one or more babies, while 38 (3.1 per cent) were pregnant at the time the backache was first noticed.

The patients were next studied in an attempt to analyze the etiology of the backache. They were tabulated according to the provisional diagnosis made at the time of entrance.

The most frequent cause of backache was found to be retroversion. Poor posture and general atonicity with loss of weight if grouped together formed the next largest group and pelvic relaxation the third. When these cases, however, were studied from the standpoint of the relief of the backache, obtained through treatment of the pathology originally diagnosed, it was found that, in many instances, the backache was not relieved, although the originally diagnosed pathologic condition was corrected. That is, the diagnosis so far as the etiology of the backache was concerned had been in error.

A more detailed study of the treatment and results of each of these various abnormal conditions follow:

1. *Retroversion*.—There were 50 cases or 24.4 per cent. Of these, 35 carried out the treatment advised. Twenty-one of the 35 patients were either cured or greatly improved. That is, in 60 per cent of the cases of retroversion, the pelvic pathology was wholly or in great part responsible for the backache. In 14 cases, or 40 per cent, however, correction of the retroversion had no effect on the backache. From this it would seem that the diagnosis of the pelvic pathology as the cause of backache in these cases was incorrect. These 14 cases were studied further and it was found that upon giving them supportive abdominal corsets and abdominal exercises, eleven were cured or greatly relieved of backache. These eleven cases should therefore be included under the classification of poor posture rather than under that of retroversion.

Because retroversion may so often exist without causing trouble, the rule has been adopted of proving such retroversion the true etiologic factor of various complaints, before advising operative procedure. This may easily be done in the majority of cases by correcting the retroversion temporarily with a pessary. If following such a procedure the patient's complaints disappear, only to recur upon removal of the pessary and return of the retrodisplacement, one may assume that the retroversion is the source of the trouble and operation may be advised with fair assurance of a good postoperative prognosis.

2. *Pelvic Relaxation*.—Under this head were included all patients having cystocele, rectocele, or prolapse, or a combination of one or more of these conditions. In all there were 38 cases, or 13.8 per cent which seemed to belong in this class.

Sixteen, or 84 per cent, of patients who followed the advice given were greatly improved so far as the backache was concerned. It is, however, interesting to note that in two cases out of three where corsets and pessaries were employed the results were poor. This may be explained by the fact that if the intraabdominal tension is increased by abdominal supports and exercises in cases having pelvic relaxation, the latter conditions will almost invariably be augmented and give rise to increased trouble. Therefore, in cases of poor posture combined with pelvic relaxation, the pelvic support should first be restored so as to prevent accentuation of the pelvic relaxation by supportive abdominal regim. In one case where operation failed to cure the backache the patient was subsequently given a corset with relief of symptoms. In the three cases relieved by corsets, the pelvic relaxation was very slight. These four latter cases should therefore be classed as poor posture.

3. *Fibroid Tumors of Uterus*.—Under this classification there were 19 cases or 9.3 per cent. There were nine patients who followed the advice given and had the tumors removed by either myomectomy or hysterectomy. In each instance the backache was cured. The ten patients who did not follow the advice given, did not return and are therefore not available for study. These results seem somewhat surprising as it is difficult to see how a fibroid tumor per se unless

of enormous size could cause backache. None of the tumors included in this series could be termed enormous, the largest being about the size of a large grapefruit. The fact remains, however, that in each case the backache was eradicated upon removal of the tumor. The latter must therefore be considered as the cause of the backache.

4. *Bilateral Cervical Laceration with Erosion and Endocervicitis*.—Under this head fell 16 cases or 7.8 per cent. Ten of the twelve cases (80 per cent) treated by cautery, were practically cured of the backache. The exact method by which cervical erosion may cause backache is also somewhat obscure. In these cases the anterior sacroiliac ligaments are often extremely tender to vaginal examination. It is possible that a low grade infection is carried backward to the sacroiliac joints by the lymphatics of the sacrouterine ligaments. In both of the two failures of this series subsequent relief was obtained by the use of abdominal exercises and supportive corsets, thus placing these two cases under the classification of poor posture.

5. *Pelvic Inflammation* was noted in 13 cases or 6.3 per cent. Of the six patients following the advice given, there were two cures, two improvements and two failures. The two cases tabulated as "improved" are placed in that class because they have been under observation only a short time. Eventually they will probably go under the heading of "cured," as to date they have been relieved of the backache. In the two cases recorded as "failures" it is felt that the conservative treatment will have to be substituted by operative procedure, in which event it is hoped that the backache will be relieved.

6. *Pelvic Relaxation and Retroversion* was found in eleven cases or 5.3 per cent. Six patients followed the treatment advised. Of this number there were two cures, one improvement and three failures. The one case not relieved of backache following repair of the pelvic condition was subsequently aided by a corset and abdominal exercises. This means it should be placed under the heading of poor posture. There were three cases where the retroversion was relieved by pessary and the patients given corsets without repair of the pelvic relaxation. Two of these three cases failed to be relieved of backache. This again brings out the necessity of obtaining adequate pelvic support before increasing the intraabdominal pressure.

7. *Miscellaneous Causes*.—Under this head were included three cases of sacroiliac arthritis, three cases of back injury, two cases of pyelitis, one tubal pregnancy, and one case of bilateral chocolate cyst of the ovaries.

(a) *Sacroiliac Arthritis*.—Here there were three cases, or 1.5 per cent. The two patients who followed the advice given, that is removal of the septic focus of infection, were relieved of the backache.

(b) *Back Injury*.—There were three cases of back injury or 1.5 per cent. Two of these patients were referred to orthopedic surgeons, who obtained relief of the backache by the use of proper back support. The third, a very mild affair, was relieved by merely relacing her corset.

(c) *Pyelitis*.—Two cases of pyelitis or 0.8 per cent were relieved of the backache upon the clearing up of the pyelitis by medical treatment.

(d) *Tubal Pregnancy*.—One case of tubal pregnancy (0.4 per cent) complained of backache which was relieved following operation and correction of the pelvic pathology.

(e) *Bilateral Chocolate Cyst of the Ovaries*.—There was one case of this type; the backache disappeared following operation and removal of the cysts.

8. *Poor Posture and General Atonicity*.—These two groups have been classed together because it is felt that in reality they are merely different manifestations of the same process. Under the former heading there were 37 cases or 18.1 per cent while under the latter there were 11 cases or 5.3 per cent.

(a) *General Atonicity*.—Under this head there were eleven patients. Seven of these were relieved by general hygienic measures such as increased weight, forced feedings, definite rest periods and gradually increasing outdoor exercise. Three patients refused the treatment advised while in one the treatment has not as yet been carried out over a sufficient length of time to warrant any definite statement as to the final outcome.

(b) *Poor Posture*.—Here there were 37 cases or 18.1 per cent. Improvement of the backache was obtained in 27 out of 28 patients who faithfully followed the treatment advised. In one case the treatment failed to relieve the backache.

From the preceding groups, however, there were in all 19 patients in whom, by subsequent study and treatment, the cause of the backache proved to be due to poor posture. It becomes necessary, therefore, to revise the first ascribed etiology of backache in this series. In a revised classification only those patients have been included who followed out treatment, and they have been placed in the group to which they belong so far as the backache is concerned.

Apparently poor posture proved to be the cause of backache more than twice as often as any other one cause and over one-third of all cases (37.9 per cent) could be attributed to this etiology. By posture is meant the relation of the various parts of the body to each other. Goldthwaite in the Shattuck Lecture for 1925 states that the body is in good or normal posture when "all of the structures are in such adjustment that there is no particular strain on any part." In this position the body is made as tall as possible without rising on the toes. The head is erect, the chest expanded, and the diaphragm raised. The abdominal wall is rounded above and firm and flat below so that the abdominal cavity assumes the shape of an inverted pear. By this means the abdominal contents are held well up in place without causing undue strain on their mesenteric attachments. Again with the body in this posture most of the breathing is done with the diaphragmatic muscles. There occurs with each inspiration and expiration a change in intraabdominal pressure, which is a marked aid in the maintenance of the abdominal circulation, the emptying of the inferior vena cava and the return of venous blood from the lower extremities and abdomen.

As the individual begins to assume poor posture the body is thrown out of its normal relationship, the head droops forward, the chest becomes flat, the diaphragm is carried low so that most of the breathing is done by the intercostal muscles. Thus the normal rhythmic change in intraabdominal pressure is impaired, resulting in a loss of the maximum abdominal circulation. There would result, theoretically at least, a general passive congestion of the abdominal and pelvic organs. The upper abdomen becomes flat while the lower abdomen becomes rounded and ptotic. The abdominal viscera become ptotic with undue strain on their mesenteric attachments. Again as a relaxed posture is assumed, the dorsal and lumbar curves become increased with undue tension on the intraspinal ligaments. The pelvic inclination is exaggerated with sacroiliac and lumbosacral pain and backache.



Thus it can be seen why poor posture may be one of the important causes of backache. If it is to be guarded against, however, the etiology of the poor posture must be sought and corrected. Some of the more important etiologic factors leading to this condition are: (1) Improper habits; (2) general muscular debility; (3) the heavy ptotic abdomen; (4) improper footwear; (5) pregnancy.

The first of these needs no elaboration. It can be easily seen that a person with perfect posture, if she allows herself to become stooped while doing her daily work will soon acquire the habit of poor posture and become unable to use her body properly. Examples of the second type, that of general muscular atonicity, are so common that they are met with each day in the general run of practice. These patients are the thin anemic type who become tired out on the least exertion. They have neither the physical energy to hold themselves in proper posture nor the mental energy to develop this physical stamina. They are the type of patients who go from operation to operation, relieved for a short time, only to return soon with some new complaint or a recurrence of the old.

The heavy type of individual with a fat ptotic abdomen usually does not develop poor posture until late in life. Here the loss of posture is due to the forward pull of the heavy ptotic abdomen. The center of gravity is thus thrown forward and there results an increase lordosis to maintain the equilibrium. Thus the lumbosacral and sacroiliac ligaments are put under undue strain with resulting backache.

In the younger type of individuals, especially the young girls, footwear often plays an important part in developing poor posture. In this instance the French heels throw the center of gravity forward. To maintain the balance the individual assumes a position of increased lordosis, with resulting back and joint strain.

Finally, pregnancy is an extremely frequent cause of abnormal postural development. During pregnancy there is a gradual increase in the size of the abdomen. The center of gravity is thrown forward and again there occurs a compensatory lordosis to maintain the equilibrium. As the uterus increases in size, the abdominal muscles become extremely stretched and thinned out. With the advent of labor the intraabdominal contents are suddenly reduced. The abdominal wall at times, however, regains its tone extremely slowly. When after ten to fourteen days the patient assumes the upright posture, the abdominal wall is still relaxed, thus allowing the abdominal contents to prolapse into the lower abdomen. The upper abdomen becomes flat; the chest begins to droop; and the beginning stages of poor posture are well established.

If the above be true, it would naturally follow that backache, the symptom of poor posture with which this paper deals, should be found more frequently among women who have borne children than among

nulliparous women. Of the 943 cases here recorded, 327 were nulliparae while 616 had borne children. There were 42 cases of backache among the nulliparae, or 12.8 per cent, while among the multiparous patients there were 201 cases of backache or 32.6 per cent.

In this series, at least, backache was 2.5 times as frequent among multiparous as among nulliparous women.

Also if pregnancy plays an important rôle in the development of poor posture, it might be expected that the onset of the backache would often be attributed by the patient to a previous pregnancy. In analyzing the time of onset of the 201 cases of backache in multiparae it was found that 58 or 28.8 per cent came on immediately following pregnancy, while 38 or 18.4 per cent came on during pregnancy. In 105 cases the backache was not related to pregnancy by the patient. That is in 96 cases or 46.2 per cent the backache was definitely related to pregnancy by the patient.

Still further proof of the contention that pregnancy is one of the precursors of poor posture is found in the treatment and results obtained on the 38 cases in this series where backache came on during pregnancy. Thirty-three of these were given maternity corsets, which were, at regular intervals, fitted so as to give the enlarging abdomen proper support. Of these the backache was completely relieved in eight cases, markedly improved in 20 cases, while in five cases there was very little relief. The remaining five cases were advised to get maternity corsets, but never returned to the office so no follow-up record is obtainable. Twenty-two of the 33 cases treated above were given corsets and abdominal exercises postpartum. Nineteen of these 22 had no return of backache while in three cases the backache returned and was not relieved until the uterus was restored to position by a pessary. There were, however, several cases in this group who had postpartum retroversion without any complaints. On the other hand, of the eleven cases where corset and exercises were not given postpartum, six or over 50 per cent complained of varying amounts of backache following the puerperium. The backache in one of these six was cured by the use of a pessary. Relief in the others, however, despite the fact that two of the five had postpartum retroversions, was not obtained until the relaxed abdomen was given proper support.

#### SUMMARY

It is realized that the number of cases here reported is too small to warrant any definite conclusions. The results would seem to indicate, however, that backache is a common symptom among women consulting the gynecologist and obstetrician, being present in 243 or 24.3 per cent of the cases in this series. Study of these cases would show that while abnormal pelvic conditions can be, and often are, the cause of the backache, there still remain many cases where correction of

the pathology has little or no effect upon the backache. Such cases, if studied from a postural standpoint will often show abnormal posture. Correction of this condition leads to a good prognosis so far as the relief of backache is concerned. In the present series posture was shown to be the underlying cause of backache in 37 per cent of cases while the next most frequent cause was retroversion with only 15 per cent of cases. Again it would seem that poor posture is often a result of the overstretching of the abdominal wall during pregnancy. Finally, such damage can in many cases, be reduced or prevented, by proper support and reconstructive exercises.

511 MAYER BUILDING.

### UTERUS DIDELPHYS\*

BY CHARLES G. LEVISON, M.D., F.R.C.S., AND MAST WOLFSON, M.D.  
SAN FRANCISCO, CALIF.

**C**ASES of fully developed uterus didelphys, or double uterus, are quite rare. Therefore the following case appears worthy of record.

Patient was thirty-eight years of age; housewife and waitress. She complained of pain in the left lower quadrant and left leg.

She was married at the age of fourteen, had three pregnancies, and one miscarriage at six months, induced.

Fourteen years previously, the patient suffered with considerable pain on the right side of the abdomen. A right salpingectomy, appendectomy, and myomectomy were performed at that time. She remained well until five years ago when she began having pain in the left side four or five days before catamenia set in, and five days afterwards. This condition gradually became exaggerated, the pains being so severe that the patient was unable to sleep nights. Treatment was not of any avail. The pain was not related to food, but definitely to periods. At times she was bothered with flatulence, belching, and sour taste. She was never nauseated, and had no dizzy spells and no icterus.

The uterus was anteflexed, small, and drawn to left. There was marked tenderness in the left fornix. Tube and ovary were palpated in a mass connected to the left side of the uterus. There were bilateral cervical orifices with a septum between.

Operation, Oct. 21, 1926, by Dr. C. G. Levison. An old low midabdominal scar was incised. Fascia were incised from pubis to navel, and the muscles were infiltrated with 0.5 per cent novocaine, after which the peritoneum was opened. A large wide band of omental adhesions was attached to the parietal peritoneum as well as to the fundus of the uterus and was partially covered with bladder anteriorly. Inspection of the pelvis showed that the fundus of the uterus was partially covered with bladder anteriorly. Attached to the left cornu appeared to be sigmoid, plus omental, adhesions. This mass was carefully dissected from the uterus. There was a marked left oophoritis and salpingitis. A small, soft diverticulum of the sigmoid with three small nodules adjoining it was found. This was not disturbed. A supravaginal hysterectomy was performed, using the reflected peritoneum from the bladder for peritonealization. There was an anomalous structure like a severed ureter at its distal end. It was traced up toward the pelvis of the left kidney. On further dis-

\*From the Surgical Service of Dr. Charles G. Levison, Mount Zion Hospital.

section, this did not resemble a ureter, but a fibrous band of adhesions. A mass the size of a lemon was found retroperitoneally on the right side of the pelvis. After examination, it was found that this extended down apparently to the right cervix, so that we were dealing with the right fundus of a double uterus. The fallopian tube on this side was removed at the former operation. The ovary was buried in adhesions and as there was no apparent pathologic condition here, the operation was terminated after the sigmoid was placed in the pelvis, and the omentum was placed advantageously in the abdomen. The abdomen was closed in the usual manner, using plain No. 2 catgut for continuous sutures for the peritoneum, muscle,

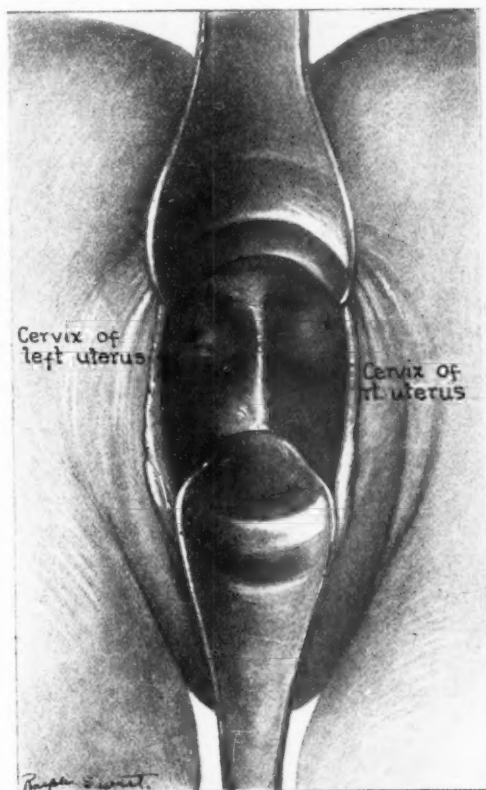


Fig. 1.—View of bilateral cervixes and septum between.

and fascia. Several interrupted linen sutures reinforced the fascial layer. The skin was closed with interrupted silk sutures. Patient left the table in excellent condition.

Diagnosis: Double uterus. Left salpingitis and oophoritis. Fibroid uterus. Adhesions of omentum and sigmoid to the uterus.

The patient made an uneventful recovery. She is menstruating from the right uterus each month.

Cystoscopic examination Nov. 4, 1926, by Dr. L. C. Jacobs. Bladder wall and mucosa were normal. Ureteral orifices were negative and catheters were inserted easily on both sides reaching the pelvis of both kidneys. Indigo carmine was injected intravenously and appeared at both ureteral orifices in less than five minutes. Urine was negative. A cystogram showed a bladder diverticulum on the right. Both ureters were intact, and both kidneys were functioning.

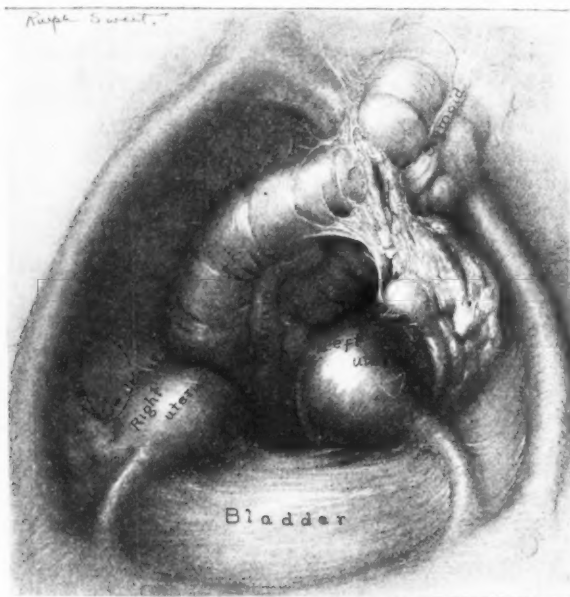


Fig. 2.—View of pelvis looking in through the open abdominal wound. The left uterus with the tube, ovary, and adhesions to the sigmoid are clearly seen inbedded in one mass. The right uterus is seen in position retroperitoneal. The right ovary is outlined and was in a mass of adhesions caused by the former right salpingectomy. The bladder may be seen with a small diverticulum near the right uterus and round ligament.



Fig. 3.—Parasagittal section, knee chest position. This shows the long membrane dividing the vagina. An arrow points to the left cervix.

Three weeks after operation, when the patient was up and about the hospital, a further study of the abnormality was made. An x-ray picture, after lipiodine injection, showed the oil in the right uterine cavity and cervical canal. No right tube was discernible. The left cervical os was obliterated completely by the use of the electric cautery at the operation.

2200 POST STREET.



## SPINAL ANESTHESIA IN OBSTETRICS\*

By S. A. COSGROVE, M.D., F.A.C.S., JERSEY CITY, N. J.

FOR we know that every creature \* \* \* travailleth in pain \* \*.” Thus the ancient world accepted the inevitability of pain in labor. Modern obstetricians rebel against this inevitable relation, and have acquired a considerable armamentarium with which to combat it. These resources embrace a variety of agents and methods sufficient to afford considerable flexibility in meeting with varying conditions.

But it must be admitted that no single agent, or method, or combination thereof, is at the present time adequate to completely divorce the function of parturition from suffering. Investigation, therefore, of the possibility of any method not included among those commonly in use, may contribute to this desirable end.

A method which would block the pelvic sensory supply without affecting the motor activity of the uterus too greatly, would be ideal. At first thought, it would appear that some form of regional anesthesia might offer this combination. But more intimate study of the matter is not encouraging.

Regional anesthesia, of whatever type, to be of general obstetric usefulness, must anesthetize the lower abdominal parietes, perineum, external genitalia, pelvic peritoneum and pelvic viscera.

1. *Infiltration anesthesia* is obviously too restricted in its area of effectiveness, although it has a definitely valuable place in abdominal hysterotomy in selected cases where the cooperation of the patient can be depended upon.

2. *Regional block*, extrinsic to the spinal column, of the entire nerve supply of the parts indicated is technically more or less tedious and difficult, and a decided tax on the patient.

3. *Caudal infiltration* of the terminal filaments of the cord extrinsic to the spinal sac is occasionally difficult, the onset of the anesthesia is slow and the area affected is less extensive than that indicated as desirable. Both of these methods are not uniformly of satisfactory efficiency.

4. *Spinal block*, whereby the spinal roots themselves are bathed by the anesthetic solution at their exit from the cord within the dura, is the only one which is simple in technic, practically unfailing in effectiveness and sufficiently wide in its area of anesthesia. But certain systemic dangers are potentially inherent in it.

Finally, all of these procedures are so transitory in the duration of their effect as to sharply limit their obstetric usefulness.

\*Read by invitation at a meeting of the New York Obstetrical Society, March 8, 1927.

Yet considerations more or less peculiar to obstetrics impel the most careful scrutiny of the possibilities of anesthetic methods other than inhalation narcosis. These considerations have to do with the treatment of pregnancy toxemias. At the risk of entering upon dangerously controversial ground, brief allusion must be made to them.

There is general agreement that the pathogenetic basis for eclampsia and the lesser toxemias identical in their pathogenesis with it, is unknown. All that is certainly known is that they occur in conjunction with, or shortly following, and depend upon the presence of a conception product in the uterus. Their treatment has always depended upon four indications: (a) prophylaxis; (b) removal of the gestation product; (c) acceleration of general eliminative processes, and (d) alleviation of symptoms.

As to the importance and means of prophylaxis there is general agreement. Also there is substantial subscription to the necessity, when less active prophylactic measures fail, for the removal of the gestation product by more or less radical procedures, as a part of the scheme of prophylaxis. The importance of this measure is countenanced in those toxic cases which are eclamptic in all but the actual occurrence of convulsions. This termination of pregnancy is the only measure at our command which is in any sense directed toward the etiology or pathogenesis of the disease.

The removal of the gestation product in the actual treatment of eclampsia after the onset of convulsions was generally practiced up to less than two decades ago. The means frequently used, however, entailed excessive trauma, shock, and factors of increased toxemia. So, under the leadership of Stroganoff, there began a revulsion against this practice and that revulsion is still in full swing. A majority of the most eminent authorities and a most formidable mass of statistics attest that the eclamptic has a greater chance of recovery if the conception product is ignored and all attention concentrated on elimination and symptomatic treatment.

This presents a paradox. A preeclamptic patient is accorded the benefit of removal of the gestation product, the most direct attack on the cause of her illness. The same patient, in the same hands, is denied this benefit the moment she becomes sick enough to have a convulsion. The baby is permitted a chance for life and health if convulsions threaten. It is condemned to run the slim chance of surviving its mother's toxemia if convulsions actually supervene.

The reason for this undoubted paradox is said to be that with the onset of convulsions there is superadded to the patient's condition an increased susceptibility to shock and a heightened acidosis which gravely increase the risk of interference which, to be prompt enough to be of value, must in many cases be operative.

This we concede. But we have nevertheless believed for many

years that the best treatment for eclampsia, as is conceded by others for preeclamptic conditions resistant to other treatment, includes the removal of the gestation product at a time as early, and by means of such nature, as will not in any detail increase the danger to the mother.

This is not the occasion for the statement of extended evidence in support of this contention. We do believe that our own experience supports it. DeLee is conforming more and more to it in his practice. Private advices are to the effect that many of the large Continental clinics are tending at present to greater radicalism. Stander, of Johns Hopkins, recently indicated a partial leaning of opinion toward it. Even very conservative observers include acceleration of the termination of labor in their programs; this, no doubt, to minimize the shock of prolonged labor, but, we suspect, not without a decided sense of satisfaction that the conception product is out, nor a lively appreciation of the enhancement of the prognosis thereby.

The real difficulty of the situation is in finding the means to terminate the gestation soon enough to be of benefit, without adding to the maternal jeopardy. We believe that the use of inhalation narcosis is incompatible with the solution of this problem.

Thus at nearly every point it specifically augments the disorders characteristically observed in eclampsia and tends to increase fetal asphyxia, which is especially undesirable when superadded to a similar tendency present as a result of the maternal toxemia of eclampsia.

Spinal anesthesia, on the other hand, decreases arterial tension, thus attaining the exact symptomatic effect aimed at by many details of the accepted treatment of eclampsia. It lowers intracranial and intraspinal pressure as a secondary effect of its lowering blood pressure and lowers intraspinal pressure directly by the evacuation of the spinal fluid, as spinal puncture has been deliberately used for this purpose. Spinal anesthesia has no effect on the liver and kidneys and by lowering blood pressure and slowing the heart rate relieves the overstrained myocardium. It has no deleterious action on the respiratory tract, does not intoxicate the central neurons, protects the central neurons from noxious shock influences by complete blocking of the peripheral neurons. Spinal anesthesia lessens extent of convulsive involvement by the same blocking. It does not cause cyanosis and has no deleterious effect on the fetus.

Theoretically, therefore, spinal anesthesia would appear to be ideal for employment in any operative procedure undertaken in preeclampsia or eclampsia and hence to have a legitimate and important place in obstetrics.

In order to determine whether its practical application bears out its theoretic desirability we must consider (1) the advantages claimed for it, (2) the dangers urged against it, (3) the extent of general ex-

perience with its use in general surgery and in obstetrics, and (4) personal experience with it.

1. *The advantages* claimed for it by all observers familiar with its use are those already enumerated; besides, there is perfect analgesia, absolute muscular relaxation of parietes and viscera, stimulation of intestinal peristalsis, no toxicity due to absorption of drug, freedom from postoperative nausea, shock, ileus, lessened bleeding during operation, and immediate postoperative ability to ingest nutriment.

2. *The dangers* urged against spinal anesthesia are vasomotor, cardiac, and respiratory paralysis; nausea and vomiting during operation; paralysis of abducens, sphincter ani, nerves of extremities; bad psychic reaction of patients, both to the administration and to the operative procedure carried out while they are conscious.

This is a formidable indictment. But the many earnest workers most familiar with the method insist that most of these either do not occur in experienced hands, or can be obviated or controlled by refinement of technic and choice of cases for its use. Fatalities or dangerous reactions occur, according to these observers, only from grossly careless choice of risks.

3. *The extent of the general use* of spinal anesthesia is hard to estimate. First used almost forty years ago, and especially refined in technic during the last two decades, there have been in every principal country a few faithful exponents of the method. From their clinics come reports of large series of cases. In addition, many other operators have used or are using it, not all of whose material has been reported. It would appear from many references that its use is increasing with better understanding of it and closer discrimination as to its indications.

The obstetric use of spinal anesthesia does not appear to be as widespread as its use in surgery. A few recent reports have been made of it. A large number of obstetric operations are included in several large series published by various surgeons, without special discussion from the obstetric viewpoint.

In order to determine the extent of its obstetric use in this country, I recently addressed letters to one hundred and thirty-four American and Canadian special and general hospitals having obstetric services. Of these, ninety-three replied. Of the ninety-three, fifty-five sent a categorical negative as to its present or past use; thirty-eight qualified their answers as follows:

(1) Fifteen were satisfied with other methods, including ether, nitrous oxide, "twilight sleep," rectal anesthesia, ethylene, infiltration. It is evident from several of these that there is not a clear understanding that spinal anesthesia is unsuitable, and cannot replace other methods, for the production of first stage analgesia.

(2) Three expressed definite disapproval, distrust, fear, or dissatisfaction after some experience with it; one of these stated that it had been satisfactory, but they were evidently fearful of it; another will be referred to later.

Twelve without experience similarly expressed themselves.

(3) Five refer to use of sacral or caudal anesthesia; one, unsatisfactory; one, satisfactory in 80 per cent of cases; one, apparently abandoned; one, experimenting at present.

(4) One refers to use of regional block.

(5) One proposes to institute its use.

(6) Three refer to general adverse sentiment in community, presumably on the part of surgeons, with or without experience.

(7) Four are using it; one very rarely; one (J. Whitridge Williams) began a few months ago, has too small an experience to justify authoritative conclusions; two will be referred to later.

(8) One refers to satisfactory surgical use.

(9) Two were interested, but had no experience.

The two most complete answers reflect opposite experience and conclusions. Dr. P. Brooke Bland, of Philadelphia, says:

"1. The method is used occasionally. We regard it too dangerous for ordinary use.

"2. It is the most satisfactory as regards relaxation in abdominal work.

"3. We use stovaine ampules or Babcock's solution and, also, 1 per cent novocaine. It is injected in the left side of the spinal column on the level of the crest of the ilium. We were using it a great deal more ten years ago than we are today. Its use, therefore, is decreasing, not increasing. It was employed largely in cesarean section, especially in pregnant women with toxemia. It has been abandoned largely because we have had more deaths from its use than from any other anesthetic we have ever used."

Dr. R. Elsie Arbuthnot, of Los Angeles, says:

"1. Spinal anesthesia is used in the obstetric department.

"2. (a) It is satisfactory. Its use is increasing.

(b) The dose varies from 100 to 150 mg. of novocaine (Metz). The injection is made between the third and fourth lumbar vertebrae. The amount of fluid withdrawn to dissolve the novocaine varies from 4 to 7 c.c. If the delivery is to be by the vaginal route only 100 mg. of novocaine are used and not over 4 c.c. of fluid are withdrawn. If the delivery is to be by Cesarean section the dose varies from 120 to 150 mg. and 7 c.c. of fluid are withdrawn.

"(c) It is used in patients having pulmonary tuberculosis, serious heart lesions, and pneumonia."



Thus there are only four of eighty-six representative services using spinal anesthesia in obstetrics, certainly a poor showing for a method which has a rather wide surgical recognition as definitely advantageous in certain types of poor anesthetic risks.

4. *Personal experience.* In undertaking the use of the method upon which our own as yet small experience is based, we found a number of differences in technical detail advised. The discomforts and dangers sometimes attending its use are directly related to several factors, including the minute details of technic. By considering each of these factors, we have hoped to obtain a composite technic which would give the widest possible margin of safety.

(1) *The Age and General Condition of the Patient.*—In general, obstetric patients are relatively young and sthenic; even so, there must be careful individualization; arterial hypotension is a positive contraindication; in our practice we have placed the safe systolic minimum at 110 mm. Hg.

(2) *Agent Used.*—We have selected novocaine because it is the least toxic of the several drugs available.

(3) *Amount Used.*—Our dosage has varied experimentally from 35 to 100 mg. We have tried to ascertain the least dose necessary for complete anesthesia. We have standardized on 50 mg. for vaginal and perineal operations and 75 mg. for laparotomies. This is about one-half the average dose used by various authorities, yet the anesthesia is perfect.

(4) *Type of Needle Used.*—Our needles are of small caliber, 22 to 20 gauge. If too large needles are used postoperative headaches occur. The Babcock short-bevel sharp needle and the Greene sharp conical pointed needle have seemed to be equally satisfactory.

(5) *The Level of the Puncture.*—We have found the fourth lumbar interspace a proper level for vaginal and perineal work, the level of anesthesia reaching up to or a little above the mons. The third lumbar interspace gives anesthesia up to or above the umbilicus, which is sufficient for low laparotomies. As these levels are below the termination of the cord proper, danger of direct cord injury is negligible, and involvement of the white rami communicantes of anterior roots, with consequent blood pressure fall, is minimal.

(6) *Diluent Used.*—We use spinal fluid to dissolve accurately measured weights of sterilized novocaine crystals in sealed ampules. This simplifies preparation of the solution and obviates the introduction into the canal of any foreign material other than the drug itself.

(7) *Force and Speed of the Injection.*—Injections are made as slowly as possible, and with no force, thus restricting diffusion, and so minimizing blood-pressure fall.

(8) *Amount of Spinal Fluid Withdrawn.*—Two to two and a half c.c. are sufficient to quickly and thoroughly dissolve the novocaine. Less may limit the area of anesthesia, or prolong its onset; more is not necessary; none in excess of this required amount is removed.

(9) *Reaspiration of Spinal Fluid During the Injection.*—This is only necessary to obtain sufficient diffusion for much wider areas of anesthesia than we need; we therefore do not practice it.

(10) *Posture of Patient.*—The lateral posture is easier for the patient in active labor, entails less effort on her part, and is simple for the operator. We have used it in preference to the erect.

A special chart was devised to systematize our findings. Up to February 12, 1927, we have employed spinal anesthesia in fifty-four cases. The conditions for which it was used were:

Normal labor, second stage, termination,	10 cases
Foreeps extraction	
Low:	
For mechanical indication	8
For eclampsia	1
For fetal distress	1
Median:	
For mechanical indication	11
For eclampsia	1
Breech extraction	2
Cesarean section:	
For mechanical indication	13
For placenta previa	1
For preeclamptic toxemia	1
Version:	
For mechanical indication	1
Following induction for preeclamptic toxemia	2
Vaginal Cesarean section for eclampsia seventh month	1
Manual removal placenta	1

These cases of course included, experimentally, a number of operations for which there was no special indication for spinal anesthesia.

All of the patients except four were in active labor at the induction of anesthesia, so that the efficiency of it in controlling the pain of uterine contractions was well tested.

DOSAGE OF NOVOCAINE WAS:

35 mg.	2 cases
40	4
45	1
50	32
75	10
85	2
90	1
100	2

The systolic blood pressure appeared to vary directly with the dosage:

	DOSE UP TO				
	50 MG.	75 MG.	85 MG.	90 MG.	100 MG.
a. Variation slight (less than 10 mm.) cases	13	1			
b. Variation moderate (10-40 mm.)	21	5			
c. Variation great (40-90 mm.)	5	4	2	1	2

Exclusive of the hypertension cases, the range of variation in the two dosages most used was:

	50 MG. DOSE	75 MG. DOSE
Minimum variation, mm. Hg.	0	5
Maximum	50	65
Average	23.7	38

The variation in systolic blood pressure would seem to vary also directly with the reading at the time of injection, i.e., the higher the initial systolic pressure, the greater the variation for corresponding dosage of the drug, thus:

Initial Rdg.	Variation	Initial Rdg.	Variation	Initial Rdg.	Variation
DOSE 50 MG.		75 MG.		100 MG.	
180	90	200	70	160	80
180	90	150	45	140	70
174	50	144	40		
172	45				
170	50				
150	40				
140	40				
140	40				
130	30				
130	20				
115	0				

Thus there were nine cases with variations of 50 mm. Hg. or more, and of these, all but two were in hypertension cases (initial readings of more than 140 mm. Hg.).

Actual minimum systolic readings were:

Below 100 mm. Hg.	14 cases
Down to 70	2
62	1
55	1

The effect on the diastolic pressure is less than on the systolic; the net result is therefore a decrease in the pulse pressure.

Adrenalin, subcutaneously, 3 to 5 minims, is efficacious in controlling excessive blood pressure fall, and is the only measure we have resorted to and only occasionally have we even done this.

The pulse rate, in the anesthetic doses employed, showed relatively little change; where there was variation, it was lowered in all except four cases; where the variation was more than slight, the graph tended to follow the graph of the systolic blood pressure, but the variation was not usually relatively so great.

The effect of the anesthetic on uterine contractions is to lessen or abolish them. This effect is transitory, however, and they are generally reestablished with their former vigor in from fifteen to thirty minutes, long before the termination of the anesthesia itself. The irritability of the uterine muscle is not abolished, however, as within a few minutes of the injection mechanical irritation of the cervix, such

as forceps extraction, will induce uterine contractions. Such contractions may be moderately painful if the injection is in the fourth space, but only slightly so or not at all if the injection is in the third space. The postpartum uterine tone and the response to oxytocics postpartum did not in any case appear to be less than normal.

The duration of the anesthesia can be counted on for from forty-five minutes to one hour; it does not depend on the dose, nor the level injected.

A few cases lasted much longer.

1 case, 2 hours, 10 minutes	Dose 50 mg. in L4
1 case, 2 hours, 5 minutes	85 mg. in L3
1 case, 1 hour, 50 minutes	50 mg. in L4
1 case, 1 hour, 40 minutes	75 mg. in L3
1 case, 1 hour, 30 minutes	75 mg. in L3

In many cases the exact duration of the anesthesia was not noted, as observations were not continued beyond the time consumed by the procedure for which used.

The psychic reaction to the injection is generally good, only six cases having appeared disturbed. These patients were all very nervous or exhausted before the injection. The complaint in such cases is usually paresthesia of the legs. The injection itself, if a small needle be used and an anesthetic wheal made in the skin, is only very slightly painful.

There is no deleterious effect on the child whatsoever.

The only sequelae have been:

(a) Headache, and posterior cervical pain. These were complained of by six of the first patients, in whom too large needles were used. There has not been a single case of this since the employment of the finer needles. It is best treated by the flat posture, icebags to the head, and analgesics. The longest duration in any case was seven days, and the severity of the pain has not been more than moderate.

(b) One case of mild paresthesia of one thigh, which disappeared spontaneously at the end of four weeks.

(c) Four cases of vomiting during the operation; this has always been of brief duration, and as it usually comes quickly following the injection, it has not interfered with technic while the abdomen was open.

#### SUMMARY

We believe that this work, though small, is sufficient to show that spinal anesthesia by the technic indicated and in the dosage employed, is safe for obstetric use. The single contraindication is hypotension.

It is not fitted for first-stage analgesia by reason of its short duration.

At the termination of the second stage by the vaginal route, it causes entire soft-tissue relaxation; in selected cases this property may obviate lacerations or the necessity for episiotomy; it may be used here for any condition contraindicating general narcosis; it is of course not offered for routine use.

In obstetric laparotomies it offers the same advantages which it does in general surgery, namely, complete anesthesia, thorough muscular and visceral relaxation, relatively slight bleeding, minimal post-operative discomfort, and smooth postoperative course. These advantages are definite enough to constitute a very strong appeal to us in this field of work.

Finally, inhalation narcosis is contraindicated on physiologic grounds in pregnancy toxemia and eclampsia. Where operative procedures of any sort are undertaken in this class of case, spinal anesthesia has a very special and important indication. We believe it is directly conservative of both maternal and fetal life.

Acknowledgment is made to Dr. Joseph Binder for the privilege of including one of his private cases in this series, to Drs. Hall G. Holder and Joseph Kelso, of the resident staff of the Jersey City Hospital, and Dr. C. S. Kirkby, of the interne staff of Christ Hospital, for their collaboration.

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## URETERAL STRICTURE\*

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THE careful internist and abdominal surgeon no longer venture a diagnosis of chronic appendicitis or cholecystitis by mere palpation of the abdomen. They now realize that the absence of pyuria does not exclude the urinary tract as a possible cause of chronic abdominal pain. Some of our internists can even see a possible relation between defective drainage and medical nephritis. They, therefore, insist on a urologic study, to an extent compatible with the condition of the patient, in every case where defective drainage may give rise to abdominal pain or injury to the kidney parenchyma.

This modern attitude of our colleagues places at our disposal a large volume of urologic material for scientific and statistic study. The results justify the endeavor. Fewer women are subjected to the useless sacrifice of their gall bladders, appendices, and reproductive organs. The exploratory laparotomy for supposed adhesions is becoming a rarity.

There are still many clinicians and even some urologists who point to the dangers of ureteral catheterization as a routine measure in the search for the source and cause of chronic abdominal pain. The properly trained urologist who uses gloves and ureteral catheters sterilized by boiling is not likely to cause either traumatism or infection. In the course of several thousand ureteral catheterizations we have seen only one instance of "ureteral" chills and fever.

In urologic investigations, the ureteral stricture is so often demonstrated by means of the ureteral catheter and ureterogram that our skepticism concerning its existence must abate. Temporary and permanent cures secured by dilating these strictures are too numerous to permit any doubt of their clinical entity.

Although clinical observations corroborated by ingenious diagnostic procedures are sufficient to convince the most exacting scientific mind, the relative paucity of pathologic data, operative and post-mortem, is the most important factor for controversy. The reason for this scarcity of pathologic data is apparent. An uncomplicated ureteral stricture rarely requires operative interference. When infection, due to defective drainage ensues, the primary condition is overshadowed by the kidney infection. It then becomes difficult to differentiate between cause and effect. However, even when of secondary development, these strictures assume primary importance, because

\*Read before the Philadelphia Obstetrical Society, January 6, 1927.

faulty drainage precludes the possibility of relieving the original infection. Moreover, cases of uncomplicated ureteral stricture do not end fatally; hence, postmortem evidence concerning the existence of this condition is relatively scarce. Few pathologists have thus far made an earnest attempt to search for ureteral strictures routinely.

A ureteral stricture is a narrowing of a part of the lumen by inflammatory reactions within the ureteral walls. In uncomplicated cases, the area involved is too small to give rise to frank pyuria, and the hydronephrosis which eventually supervenes is usually relatively sterile. This is one of the strongest arguments in favor of their primary nature because a preexisting infection higher up could not have subsided in the presence of faulty drainage.

Infection without back-pressure does not cause dilatation of the ureter and kidney pelvis, hence where ureteropyelography demonstrates dilatation, obstruction below the point of dilatation must exist.

Eisendrath<sup>1</sup> proved experimentally that the amount of fluid and pressure are of little importance in widening the shadow of a normal ureter, but when inflammatory changes are present, artificial widening of the ureter is possible. It is therefore necessary to withdraw the ureteral catheter and permit the excess of fluid to escape through the ureteral orifice before exposure is made. Whether the obstruction is due to causes within the ureter or to compression of the tube by adhesions, exudates, or tumors in its vicinity, the ultimate result is a varying degree of dilatation of the ureter and kidney pelvis. At times one part of the ureter bears the brunt of the back-pressure, and at other times the kidney pelvis responds sooner, depending on the congenital development of the musculature and the degree of support the affected organs receive from the surrounding structures.

Back-pressure due to an obstruction in the lower ureter causes an increase in length as well as in width of the ureter above the point of obstruction, hence the tortuosity and so-called kinking frequently seen in dilated ureters. Ureterography, after the removal of the obstruction, usually shows an almost total disappearance of the so-called kinks and dilatations. These apparent kinks are due to superimposed portions of the redundant ureter.

True kinking occurs where the upper ureter is fixed by adhesions or aberrant renal vessels, and the respective kidney has undue mobility so that the upper ureter does not sag with the kidney. The ureter below this point is not dilated unless a greater degree of obstruction exists at some point below.

Ureteral strictures, according to Hunner,<sup>2</sup> occur most frequently where the ureter has its chief lymphatic connections; namely, in the broad ligament and at the bifurcation of the internal iliacs. The presence of extraureteral shadows due to calcified glands denotes, in his opinion, chronic local infection, past or present.

Our observations are based on a study of one thousand consecutive urologic studies, a large number of which were referred to us for diagnosis by the medical service.

NUMBER OF CASES STUDIED -----	1000	
Primary ureteral stricture cases -----	122, or	12 %
Ureteral stricture with a varying degree of infection -----	45, or	4.5%
Stricture with calculus -----	17, or	1.7%
Calculus unassociated with stricture -----	11, or	1 %
Pyelitis and pyelonephritis without stricture -----	263, or	26 %
Unilateral tuberculosis -----	7, or	0.7%
Papilloma of the bladder -----	2, or	0.2%
Hypernephroma -----	2, or	0.2%
Cancer of the bladder -----	1, or	0.1%
So-called essential hematuria -----	8, or	0.8%
Primary chronic cystitis without apparent cause -----	42, or	4 %
Cases showing no urologic pathology -----	481, or	48 %

The percentage of strictures in this series is much lower than that recorded by Hunner<sup>3</sup> who finds "ureteral stricture as an associated lesion in more than 90 per cent of all hydronephroses and chronic infections of the kidney." We record 263 kidney infections without associated strictures. The reason for the difference in our findings may be found in the rigid rules governing the diagnosis of ureteral stricture in this study. Infected cases that offered no obstruction to the passage of a No. 6 catheter and showed no evidence of ureteral dilatation are classified as kidney infections unassociated with stricture. The fact is that prior to fibrous tissue formation, a No. 6 catheter may easily pass a soft infiltrated area in the ureteral wall. It is also well known that dilatation due to narrowing of the lumen does not occur until nature has made attempts to overcome the impediment through hypertrophy of the musculature in the ureteral wall and kidney pelvis. Dilatation marks nature's failure to overcome the defect and is a rather late development.

Bilateral involvement was found in 6 per cent of ureteral strictures. This is at variance with the statistics of Hunner<sup>3</sup> who finds the condition "practically always bilateral." The right ureter was the sole seat of trouble in 62 per cent of our stricture cases.

It is also interesting to note how infrequently we find a primary chronic cystitis not due to faulty catheterization.

Only about 25 per cent of ureteral-stricture cases showed gross evidence of infection; some of the others showed a few leucocytes in the urine or a positive culture for colon bacilli or staphylococci.

The relative frequency with which renal calculi are associated with stricture points to a possible causal relation. Theoretically, impairment of renal drainage favors salt deposits.

Rathburn<sup>4</sup> found ureteral strictures in 92 out of 739 cases studied. He also stresses the fact that a No. 6 catheter may pass a stricture unnoticed.

#### ETIOLOGY

There is an abundance of clinical evidence that distant foci of infection are frequently responsible for the segmental ureteritis which results in stricture formation. Associated infection of the tonsils, accessory sinuses, or teeth was found in 80 per cent of the 122 primary ureteral strictures. Attempts to prove relationship by animal inoculation of the virus, obtained from these foci, failed to demonstrate elective localization in the animal. Poor facilities for animal experimentation are responsible for our failure. In one case of persistent renal hematuria due to a stricture, relief was secured by repeated duodenal drainage of an infected gall bladder.

Cervical infections, in our opinion, bear a causal relation to ureteral stricture. The fact that most strictures are found in the lower part of the ureter which has a lymphatic connection with the cervix and the relative prevalence of ureteral stricture in women seem to support this view. Laura M. Moench<sup>5</sup> demonstrated the pathogenicity of the normal cervical flora through animal inoculation of saline suspensions of the leucorrheal material.

#### CLASSIFICATION OF SYMPTOMS

Number of primary ureteral stricture cases	122
Symptoms simulating chronic appendicitis	57, or 46%
Symptoms simulating gall bladder disease	9, or 7%
Renal colic of varying degree	21, or 16%
Tenderness and pain in the region of the kidney	21, or 16%
Increase in urinary frequency	78, or 62%
Aggravation of symptoms during menstruation	51, or 42%
Pain and tenderness in the left lower abdomen	32, or 25%
Renal hematuria as the only symptom	1

The symptoms of uncomplicated ureteral stricture are usually not sufficiently characteristic to warrant a diagnosis without the aid of the cystoscope and roentgen rays. The severity of the symptoms depends upon the degree of interference with renal drainage. A quiescent stricture may, through the development of a fresh inflammatory reaction or mere congestion incident to menstruation, become sufficiently constricted to give rise to renal colic. When infection ensues, these attacks of renal colic are associated with chills and fever,—Dietl's crisis.

We have recently seen a case of uremia in the course of an advanced cervical carcinoma. Postmortem examination showed infiltration of the lower end of both ureters and enormous dilatation of the ureters

and kidney pelves. To what extent defective renal drainage is responsible for chronic nonsuppurative nephritis is a fertile field for investigation.

#### CONCLUSIONS

1. Urologic investigation in a large number of cases presenting chronic abdominal pain of obscure origin showed that the urinary tract was responsible for the symptoms in almost 50 per cent.

2. Ureteral catheterization should be carried out with the same precision of asepsis as a major operation.

3. Primary ureteral stricture is frequently encountered in the course of urologic investigation.

4. Ureteral stricture associated with sterile hydronephrosis or hydroureter is unquestionably a primary condition, because a preceding infection above the point of stricture could not clear up in the presence of defective drainage. When associated with infection, it is difficult to differentiate between cause and effect.

5. Obstruction in the lower end of the ureter causes an increase in length as well as an increase in the caliber of the ureter above the point of obstruction. Apparent ureteral kinks are due to overlapping of the redundant ureter.

6. Diagnosis of ureteral stricture is based on the following combined evidence:

a. Difficulty in passing a No. 6 catheter.

b. The reproduction of symptoms in an aggravated form when fluid is instilled into the kidney pelvis, because of trapping of the fluid beyond the constriction.

c. Dilatation of the urinary tract above the point of obstruction as evidenced by the ureterogram.

7. One of the exposures in ureterography should be made after the ureteral catheter is withdrawn in order to avoid artificial widening of the shadow through distention.

8. There is an abundance of clinical evidence that distant foci of infection are frequently responsible for primary ureteral stricture. (Owing to poor laboratory facilities we have been unable to prove this experimentally.)

9. The essentials in treatment are the removal of every possible focus of infection and graded dilatation of the stricture area by means of bougies.

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1829 PINE STREET.



## COLPORRHEXIS, OR RUPTURE OF THE VAULT OF THE VAGINA, WITH THE REPORT OF A CASE\*

BY THOMAS O. GAMBLE, M.D., ALBANY, N. Y.

LACERATIONS of the upper third or vault of the vagina during labor are uncommon. When such injuries occur, they are usually the result of trauma accompanying manual dilatation of the cervix, instrumentation, or too rapid extraction through a partially dilated cervix. In most instances they are limited to the lateral fornices, and, almost without exception, represent extension of tears originating in the cervix. Occasionally, however, there may be more or less complete rupture of the vault of the vagina with little or no injury to the cervix or lower uterine segment. To this condition, Hugenberg, in 1875, gave the name "Kolporrhesis," and at the same time reported 40 cases which he had been able to collect from the literature.

In spite of Hugenberg's rather accurate description of this unusual complication, no clearly defined differentiation between rupture of the uterus and rupture of the vagina seems to have existed in the minds of the medical profession, as shown by the fact that during the next twenty years a number of cases of colporrhesis were reported as instances of simple uterine rupture. With the appearance of articles by Freund (1892), Schick (1893), Everke (1898), and Kaufman (1901) further confusion, to a large degree, was obviated.

A total of approximately 120 cases of colporrhesis have been reported to date, Kaufman making the last complete collection (82 cases) in 1903. It is interesting to note that only one of Kaufman's cases had been recorded by an American, and I have been able to find but two cases reported from the same source since 1903, one by Reed in 1905, the other by Martin and Brinkley in 1923. The explanation of this curious phenomenon probably lies in the rather cursory manner in which colporrhesis is treated in our textbooks. Williams, for instance, devotes but half a page to the subject in the last edition of his textbook; DeLee, approximately one page, and Edgar, 15 lines. In view of these facts, it has seemed advisable to report the following case of spontaneous colporrhesis, and at the same time to review briefly the literature upon this interesting obstetric complication.

The patient, a white woman, aged thirty-one, was registered in the prenatal clinic of the West End Health Center, in the City of Albany, on Feb. 25, 1926. There had been six previous pregnancies, five of which went to term, while the other ended in a spontaneous abortion at three months. She was attended by a private physician in each labor, the first two being terminated instrumentally, while the

\*Read at a meeting of the Albany County Medical Society, April 19, 1927.

last three babies were born spontaneously. Nothing further could be learned concerning her labors, except that the last one, in 1923, had been long and difficult. The only other point of interest in her past history was that she had noticed a protrusion of the umbilicus for the past five years, and had had a very large and pendulous abdomen for an equal length of time. Menstruation was normal; the last period began Sept. 9, 1925, making the probable date of confinement June 16, 1926.

The patient was of medium height but quite obese, weighing 205 pounds. Preliminary examination was negative. The abdominal walls were very lax with marked diastasis of the recti muscles. There was an umbilical hernia with a ring about 4 cm. in diameter. The uterus was enlarged to the size of a six months' pregnancy; fetal heart was distinct in the midline. Pelvic examination showed the outlet markedly relaxed, with both rectocele and cystocele; cervix was large and soft, with the external os patulous and bilaterally torn. If any scar tissue was present in the vaginal vault it was not noted. A properly fitting abdominal support was advised. Subsequent visits were made to the clinic at regular intervals.

Labor pains began at 2:30 P.M., June 25, and the patient was admitted to the Albany Hospital at 3 P.M. Pains were occurring at three-minute intervals and lasting forty seconds. Abdominal examination revealed a large child in R. O. A., with the head just entering the superior strait, but not firmly fixed. Fetal heart in the right lower quadrant. Rectal examination showed the external os practically fully dilated with the membranes apparently intact. The head could be easily dislodged by the examining finger. This examination was made at 6 o'clock and the cervix was found to be completely dilated, but the membranes had already ruptured. With the patient in the recumbent position the uterine axis did not appear distorted. At 7 o'clock the nurse in attendance left the labor room for a few minutes, and on her return found the patient standing by the side of the bed. She stated that a sudden severe pain in the lower part of the abdomen had accompanied the act of getting up. The intern called me shortly afterwards to report the complete cessation of labor pains after the patient had been returned to her bed. Coincident with the stoppage of pains there began a rather free drainage of bright red blood from the vagina. I reached the hospital at 7:45 P.M., and found the patient complaining of severe and constant abdominal pain. A hurried external examination failed to impress me with anything unusual, except the extreme sensitiveness to palpation. The pulse rate was 110 per minute, but there was little evidence of shock. On vaginal examination the fingers came into contact with what was thought to be the margins of the completely dilated cervix. Posteriorly and just within the external os was a smooth rounded structure which was believed to be the edge of a lowly implanted placenta. A tentative diagnosis of placenta previa was made, the patient was anesthetized, and the whole hand introduced into the vagina. The head was palpated riding freely above the pelvic brim. Not entirely sure of the exact nature of the complication, I passed my hand through the large opening, thought to be the external os, and into a cavity which did not feel at all similar to the uterine cavity. The baby's feet were seized and a version and extraction easily and quickly accomplished. The baby was stillborn and weighed 4530 grams. Immediately after extracting the child I was shocked to see a small bit of fatty tissue protruding from the vaginal orifice. On closer inspection this proved to be a loop of intestine with its fatty epiploic appendages. Believing I was dealing with a rupture of the uterus I replaced the intestine, packed the vagina with gauze, and ordered the patient to the operating room. Practically an hour elapsed before the abdomen was opened as it was necessary to communicate with the patient's husband before we could proceed.

At operation the placenta and a considerable quantity of blood were found in the abdominal cavity. No tear could be found in the uterus, and it was not until this organ had been removed that the true nature of the injury was clearly re-

vealed. Then it was seen that posteriorly the vagina had been completely separated from its attachment to the cervix by a transverse tear about 8 cm. in length. Extending downward from the center of this tear was another of almost equal length, so that the whole laceration presented a T-shaped appearance.

The edges of the tear were rather friable and considerable difficulty was experienced in bringing them together. A small opening was left in the vault through which four pieces of gauze were pushed into the vagina. After removing the appendix, and repairing the umbilical hernia, the abdominal incision was closed, except at the lower angle through which drainage was provided for by a single cigarette wick.

The patient was in considerable shock following the operation but reacted well, and made an uneventful recovery. She was discharged from the hospital July 19, twenty-six days postpartum.

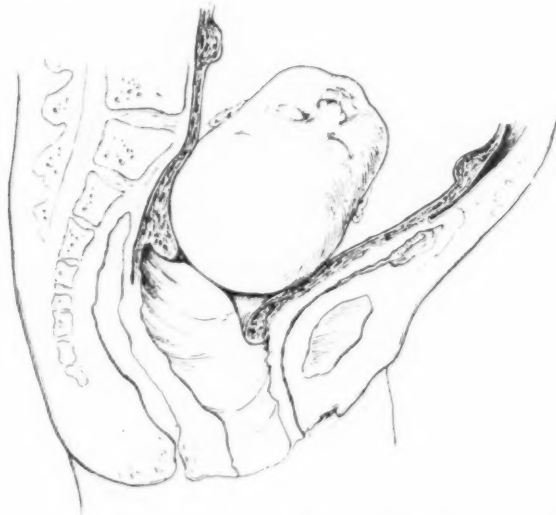


Fig. 1.—Cervix caught in front of the head. Spontaneous rupture of the vagina practically impossible.

#### ETIOLOGY

Most cases of colporrhexis are traumatic and perforating, and result from the unskillful use of forceps. Illustrative cases are those of Campbell and Lewis, Hellier, Everke, and Fothergill. Not uncommonly rupture may accompany attempts at podalic version, as was noted by Reed, Everke, and others. Ross says that a rough attempt to replace a prolapsed vagina has resulted in its rupture.

Spontaneous colporrhexis, on the other hand, is much less common, only 50 of the 120 cases reported falling within this group. It is in the etiology and mechanism of such cases that we are especially interested. Freund's theory, based upon the doctrine of the lower uterine segment and the formation of the contraction ring as elaborated by Bandl, is the one generally accepted. When, under the influence of uterine contractions, the descending part meets with some obstruction, the uterus slowly becomes retracted, the contraction ring

risks to a higher and higher level, and the passive lower uterine segment is gradually thinned out. If the lips of the cervix are incarcerated between the presenting part and the bony pelvic brim, rupture of this thinned-out lower segment will eventually occur, unless the condition is relieved by prompt delivery. (Fig. 1.) Spontaneous rupture of the vault of the vagina under such conditions Freund believes to be impossible. When, however, the lips of the cervix are not fixed, there is a retraction of the whole of the birth canal, from the contraction ring down to the attachment of the vagina to the pelvic floor. The cervix in such instances is drawn upward over the head, and when rupture occurs, it is at the weakest point, usually the posterior fornix. (Fig. 2.) Conditions under which the above mechanical factors may be fulfilled are to be observed in some cases of transverse presentation, extreme pendulous abdomen, and marked de-

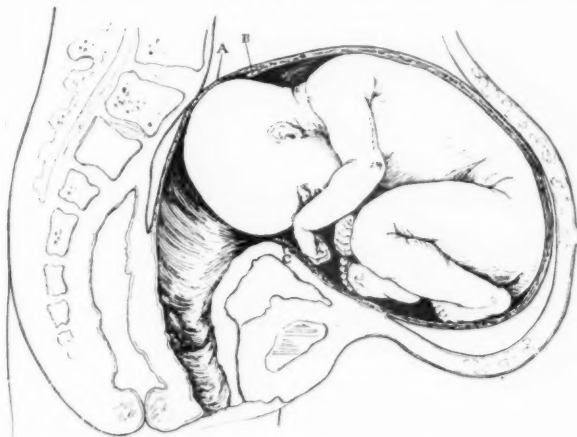


Fig. 2.—Forward and downward displacement of the fundus due to pendulous abdomen. Cervix drawn above the head. A, Point of rupture. B, Posterior lip of the cervix. C, Anterior lip.

grees of hydrocephalus. Kaufman believes that in addition to the mechanical factor, we must assume a predisposition of the tissues to rupture, but states that the only anatomic changes so far demonstrated are those which accompany repeated pregnancy. Oelschlägel points out that these anatomic changes result from the circulatory disturbances accompanying the displacements and varying degrees of prolapse of the uterus and vaginal walls so commonly observed in multiparous women, and consist of atrophy, rarefaction, and hyalinization of the musculature and connective tissue. It is to be noted, in this connection, that spontaneous colporrhesis has not as yet been observed in a primiparous woman, whereas, in over 50 per cent of the cases occurring in multiparae there have been from 6 to 14 previous pregnancies in each instance.

The presence of scar tissue in the vaginal vault, such as might

result from a pelvic abscess which has drained at this site, or from a previous rupture, traumatic or spontaneous, must be listed as predisposing causes of colporrhexis.

In considering the etiology of the case here reported, particular emphasis should be placed upon the pendulous abdomen. With the

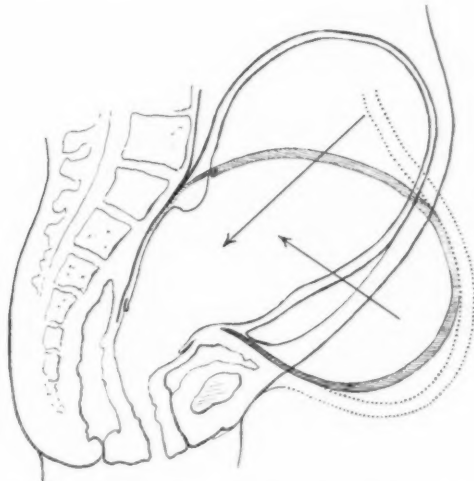


Fig. 3.—Diagram of the distortion of the uterine axis when the fundus sags downward in a pendulous abdomen.



Fig. 4.—Rupture of the posterior vaginal wall with fetus being expelled into the abdominal cavity. Prolapse of intestine into the vagina.

patient in the recumbent position there was such slight distortion of the normal axis of the uterus that the force exerted by its contractions was almost perpendicular to the plane of the superior strait. On the other hand, the moment the patient stood upright, the body of the uterus sagged downward, thus drawing the cervix above the level of the child's head, and placing the posterior wall of the vagina



under such tension that rupture occurred. At the same time the expulsive force of the uterus was directed upward and backward, so that the fetus was extruded through the torn culdesac into the abdominal cavity. (Figs. 3 and 4.)

#### PATHOLOGY

The shape and extent of the tear and the amount of damage to the adjacent tissues varies considerably with the individual case. If the rupture is traumatic and limited mainly to the anterior fornix, the bladder and urethra are frequently involved. Lateral fornix tears may extend upward into the broad ligaments, and in such cases the bleeding may be profuse due to injury to the uterine vessels. Where rupture has taken place in the posterior fornix, the vagina may be entirely separated from its attachment to the cervix in this location. The tear usually runs transversely, and frequently there is a downward extension along the posterior wall of the vagina, the whole laceration presenting a T-shaped appearance. Saks reports a case in which there was an almost complete detachment of the vagina from the cervix, laterally and anteriorly as well as posteriorly, so that the latter was literally hanging by a thread. Usually the peritoneum is torn, but rarely it may remain intact and be dissected upward as high as the level of the umbilicus. Kaufman reports a case in which the placenta was found lying in such an extraperitoneal cavity.

#### SYMPTOMATOLOGY

Clinically colporrhexis presents a picture similar to that observed in rupture of the uterus, though the symptoms of shock are usually much less severe. In cases in which the fetus is extruded into the abdominal cavity, there is a sudden and complete cessation of labor pains. The patient complains of a sensation of "something having given way" in the lower part of the abdomen or vagina. Following this there is constant pain in these locations. Palpation reveals an unusual degree of sensitiveness to touch, while the fetal outlines are much more easily made out than previously. The amount of vaginal bleeding depends upon the site of rupture, being most profuse where there is involvement of the uterine vessels. With tears of the posterior fornix, the hemorrhage is usually moderate and occasionally may be almost entirely absent. Not infrequently several loops of the intestine may prolapse into the vagina. If the patient is not seen until a number of hours after the accident, the symptoms of beginning peritonitis may be superimposed upon those of shock.

#### DIAGNOSIS

The only condition with which colporrhexis may be confused is that of uterine rupture. The diagnosis can be determined by careful digital exploration.

## PROGNOSIS

The prognosis in colporrhexis is grave, death almost invariably being due to peritonitis. Hugenberg reported a mortality of 72.5 per cent; Garnis, 62.5 per cent, and Schtschotkin, 67.5 per cent. Kaufman believes that these figures are unduly high, and asserts that the mortality should not exceed 25 per cent.

## TREATMENT

Considerable difference of opinion exists as to the most appropriate treatment. Williams agrees with Schick that laparotomy is the best method of coping with the emergency, and recommends the extirpation of the uterus when the torn surfaces of the vagina cannot be united by sutures. Kaufman urges the invariable extraction of the fetus through the vagina, even though craniotomy be necessary, followed by closure of the rent from below if possible. In many of the cases reported, the only treatment consisted in the extraction of the child and the tamponade of the vagina with gauze. Everke very strongly urges the retention of the uterus whenever possible. Naturally, the question arises as to what is the best method of dealing with future pregnancies in women who have previously been the victims of this accident. Theoretically, at least, labor in such women is very dangerous, for in addition to the factors previously present, we have the sear resulting from the rupture. Kaufman records three instances of women going through labor successfully after previous colporrhexis. Kalomenkin, Baumbach, and Saks, on the other hand, have reported cases of rupture of the vagina for a second and third time in the same patient. Accordingly, it would seem that all patients who have had previous colporrhexis should be in the hospital during the latter weeks of the next succeeding pregnancy, and cesarean section, with sterilization, performed either before or at the onset of labor.

## CONCLUSIONS

1. Colporrhexis is a serious complication of labor, and is of more frequent occurrence than a review of the American literature would indicate.
2. Its importance has been underemphasized in our textbooks.
3. A majority of the cases of colporrhexis are of traumatic origin.
4. The case of spontaneous colporrhexis reported emphasizes the importance of the pendulous abdomen as an etiologic factor.

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24 DOVE STREET.

## AN ANALYSIS OF THE MATERNAL AND FETAL DEATHS IN A SERIES OF TWO HUNDRED NINETY-ONE CESAREAN SECTIONS

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THE report recently made by the New Orleans Gynecological and Obstetrical Society, which covers the cesarean sections performed in six of the hospitals of the city over a period of six years, and which is shortly to appear in the New Orleans Medical and Surgical Journal, contains much material worthy of further intensive study. Particularly does it seem to me that an analysis of the maternal and fetal deaths in the series cannot fail to be of value, since, after all, the principal reason for cesarean section is to save two lives, and a high fetal and maternal mortality, as this undoubtedly is, definitely defeats that purpose.

It might be well, first, briefly to summarize the findings of the special committee appointed by the Society from the six hospitals represented in its membership to make the report (Dr. E. L. King, Chairman, Charity Hospital; Dr. John F. Dicks, Mercy Hospital; Dr. Hilliard E. Miller, Touro Infirmary; Dr. P. B. Salatich and Dr. H. V. Sims, Hotel Dieu; Dr. T. B. Sellers, Baptist Hospital; Dr. C. A. Wallbillich, Presbyterian Hospital). During the years covered by the report, 1921 to 1926, inclusive, two hundred, ninety-one cesarean sections were performed in the six hospitals, and the incidence, based on the fifteen thousand, two hundred and ninety deliveries in the same period, was about 1.93 per cent. The committee regarded it as worthy of special comment that the lowest incidence, 1.2 per cent, was at Charity Hospital, where the highest percentage of abnormal labors is naturally handled, and congratulated the staff, in the words of Williams, "on permitting so many operative possibilities to escape." The ages ranged from thirteen to forty-five, and the stage of gestation from five months in one case to term in 81.4 per cent. Previous abnormal labors had included thirty-five stillbirths, four craniotomies and fifty cesarean sections; five of the latter had been done for the second time.

More than a quarter of the operations were done by three men, one an obstetrician, two general surgeons, and twenty men had performed one operation each. The classical technic was employed in seventy-two cases in which operative details were given, the Porro in 4.2 per cent, the transperitoneal low cervical technic in 12.7 per cent, and miscellaneous procedures in 11.1 per cent. Sterilization by resection of the tubes was done in 11 per cent of the cases, and simultaneous operations included myomectomy once, complete hysterectomy for carcinoma of the cervix once, and appendectomy once, eclampsia being the indication for the surgical delivery. The study of the position of the fetus and the measurements is of little value, and the committee felt obliged to comment, in view of the number of times this information was lacking, that such facts are essential to any complete obstetric record. They also comment on the fact that in but seven of the fifty cases which had been previously submitted to cesarean section was the scar adequately described, which they characterize as almost a calamity, in view of the fact that only by such studies as this can any definite conclusions be reached as to the wisdom of permitting future spontaneous labors after cesarean section. The operation was elective in 18.2 per cent of the cases, and a definite test of labor was permitted in 8.2 per cent. Labor had begun in 50 per cent, the duration ranging from under five hours in six cases to over seventy-five hours in two. The number of examinations ranged from one in forty-five cases to nine in one; seven patients had had only rectal examinations and nineteen had had none at all. In the twenty-four cases in which it was stated specifically that the membranes had ruptured, the duration of the rupture ranged from under five hours in six to over forty-five hours in three. Previous manipulations included packs, forceps, version, craniotomy, excision of cervical tissue (for immediate diagnosis in suspected carcinoma of the cervix), artificial rupture of the membranes (hydramnios), manual dilatation and bags. The principal indications included contracted pelvis, eclampsia, other toxemias, placenta previa, premature separation of the placenta, disproportion, previous dystocia, previous abdominal delivery, malpositions, inertia and prolonged labor, and undilatable cervixes due to previous operations. There was also a miscellaneous group of promiscuous indications, as might be expected in a series of operations done by sixty different men. Distention was a feature of the convalescence in 36.9 per cent of the cases, and vomiting in 27.4 per cent. The recovery was definitely febrile in 63.5 per cent (based on the criterion of fever above  $101^{\circ}$  at any time, or fever above  $99^{\circ}$  for more than three days). Complications included the various types of obstetric and surgical conditions to be expected after laparotomy performed for these indications; it is worthy of special mention that dilatation of the stomach was a marked feature in seventeen cases.

The mortality tables, taken without change from the report of the Committee, are herewith appended.

An analysis of the maternal mortality from the standpoint of indications for operation (Table I) confirms, first of all, the fact which is now universally admitted, if not always universally applied, that

TABLE I. MATERNAL MORTALITY (47-16.1 PER CENT)  
ANALYZED AS TO OPERATIVE INDICATIONS

Contracted pelvis -----	8 (out of 107)
Eclampsia -----	17 (out of 41)
Other toxemias -----	3 (out of 12)
Placenta previa -----	3 (out of 33)
Premature separation placenta -----	1 (out of 6)
Disproportion -----	1 (out of 16)
Inertia and prolonged labor -----	5 (out of 28)
Cervical scar tissue -----	1 (out of 10)
Rupture uterus or scar -----	3 (out of 5)
Cardiac lesions -----	2 (out of 4)
Fibroids -----	2 (out of 2)
Not stated -----	1 (out of 2)
Total -----	47

TABLE II. MATERNAL MORTALITY ANALYZED AS TO CAUSES OF DEATH

Peritonitis -----	6
Septicemia -----	3
Rupture uterus or scar -----	3
Toxemia -----	3
Eclampsia -----	16
Placenta previa -----	1
Premature separation placenta -----	1
Acute dilatation of stomach -----	2
Pneumonia -----	1
Vaginal hemorrhage -----	2
Heart lesions -----	2
Embolus -----	5
Doubtful -----	2

TABLE III. MATERNAL MORTALITY ANALYZED AS TO DURATION OF LABOR

Elective -----	3	
Test of labor -----	1	
Labor not begun -----	20	(mainly eclampsia)
Labor begun -----	23	
Examined (stated) -----	15	(probably several others)
Membranes ruptured (stated) -----	4	(probably others)
Pack -----	1	
Attempts at delivery -----	1	(version, forceps, craniotomy)
Fever at operation -----	2	

eclampsia per se is not an indication for cesarean section. Out of forty-one eclamptics in this series of two hundred ninety-one cases, seventeen were lost, a mortality for that condition of over 41.5 per cent. More than one writer has called attention to the dual mortality of eclampsia, from the disease itself and from the radical measures employed to combat it, and in my opinion, not only the gross mortality



TABLE IV. FETAL MORTALITY (55-18.9 PER CENT)

Pelvic contraction	2	(1 attempted high forceps)
Placenta previa	13	(9 premature)
Premature separation placenta	4	(1 premature)
Eclampsia	8	(4 premature)
Toxemias	7	(4 premature)
Rupture uterus or scar	5	
Neglected labor	6	(1 premature)
Congenital malformations	4	
Tonic contraction of uterus	1	
Cerebral hemorrhage	1	(placenta previa)
Prematurity	1	
Uterine fibroids	1	
Doubtful	2	
Total	55	(20 premature)

TABLE V. MATERNAL AND FETAL MORTALITY ANALYZED BY YEARS

YEAR	MATERNAL	FETAL
1921	22 per cent	20 per cent
1922	26.3 per cent	21.5 per cent
1923	11 per cent	22.2 per cent
1924	12.5 per cent	17.5 per cent
1925	14 per cent	14 per cent
1926	10 per cent	10 per cent
Total	16.1 per cent	18.9 per cent

in this study, but the fact that more than 50 per cent of the women who were lost died within three days after operation, some of them within a few hours, seems to prove that the additional shock of such an operation is more than a thoroughly toxic patient is able to endure. Moreover, such a mortality is entirely unnecessary. Even the poorest of the conservative measures gives better results than this, and Stroganoff's latest reported mortality is less than 3 per cent. On the service of Dr. C. Jeff Miller at Charity Hospital, to quote results with which I am familiar at first hand, the employment of the modified Stroganoff method has reduced the maternal mortality to approximately 8 per cent, and I am aware that equally good results are reported from other clinics.

Of course if an absolute indication exists, in connection with the eclampsia, for the performance of cesarean section,—which was not the case in any instance in this series,—then we have no choice but to subject the patient to the additional risk. I am willing to grant, theoretically, that this mode of delivery may be warranted in the occasional case in which conservative measures have not availed, when the patient is a primipara and the cervix is long and rigid, so that induction of labor would mean extensive manipulations, thus increasing the risk of sepsis to which these women are notoriously liable, and the labor itself would probably be long and tedious. Cesarean section, however, is never justified in the acute convulsive stage, and personally I have never seen a case in which I considered it justified at all.

Equally unwise, in the average case, is the performance of cesarean section for other toxemic conditions, as the death rate of 25 per cent in this series quite clearly proves. Most of these complications can be handled satisfactorily by conservative measures, and if an increasing toxemia seems to demand emptying of the uterus, induction of labor by bag or catheter offers decidedly less risk to the patient.

The mortality for cesarean section in placenta previa in this series is less than 10 per cent, which on the surface appears excellent. I question, however, whether even that mortality is necessary in this complication. There is no doubt that abdominal delivery is occasionally warranted, particularly in the central type, when the patient is in good condition, at or near term, when infection is absent, or rather when infection has not been introduced by promiscuous examinations and other vaginal maneuvers, and when there is reason to believe that a living child may be secured, conditions which are seldom met in general practice. That other, more conservative measures, however, give better results in the average case is beyond dispute. In a series of cases studied by Dr. C. Jeff Miller in 1924 from the records of Charity Hospital, all but one of the deaths occurred in the group handled by radical measures, including cesarean section, and three-quarters of the morbidity occurred in the same group, which seems more than a coincidence. Moreover, in eighteen cases handled on Dr. Miller's own service, where conservative treatment has long been the rule, the mortality was zero, which again seems more than a coincidence.

In premature separation of the placenta the situation is different and cesarean section is frequently a justifiable procedure. This is particularly true when there is reason to believe that there has been a marked extravasation of blood into the uterine musculature, so that the organ is incapable of further contraction, even after the child has been delivered, and hysterectomy may be necessary as a life-saving measure. This mortality, one out of six cases, is certainly not exceptionally high.

The eight deaths in contracted pelvis occurred mainly, as might be expected, in unrecognized or neglected cases. A detailed study of the records makes it obvious that in many of these patients the contraction was of such a character that vaginal delivery was either impossible or extremely unlikely, and the fact that long and exhausting labors were permitted, which, to judge from the records, could not possibly be described as trial or test labors, seems to indicate that either faulty diagnosis or frank carelessness was responsible for the mortality. In the same category must be set down the one death in the sixteen cases of disproportion and the five deaths in the twenty-eight cases of uterine inertia or prolonged labor. Craniotomy, particularly on a living child, is naturally repulsive, but I question seriously whether it is any more repulsive than the performance of cesarean

section on exhausted and infected women, as many of these obviously were. The fact that in many instances the patients were admitted in this condition, after hours of labor, does not lessen the responsibility of the operating surgeon, in whose hands the final decision rests. It has long been recognized that cesarean section entails a definite risk when the patient has been in labor for hours, when the membranes have long been ruptured, when repeated examinations have been made, and when vaginal delivery has been attempted. The comprehensive studies of Routh and Holland have proved this point so adequately that further reiteration is unnecessary, but a study of Table III, which analyzes the deaths from the standpoint of the duration of labor, is illuminating.

In this connection, too, I would call attention to the very valuable study recently made of the bacterial content of the uterus at cesarean section by Harris and Brown of the Johns Hopkins Hospital and reported in the February, 1927, issue of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY. In practically every case in which the operation was done later than six hours after the onset of labor, bacteria, sometimes of a very virulent type, were found in the lower uterine segment.

It is significant, too, that in five-sixths of the patients lost in whom labor had not begun, the indications were mainly eclampsia, other toxemias and placenta previa. In one case in which the indication for abdominal delivery was the presence of fibroids, the child was dead on admission and the patient was frankly infected, the temperature being over 100° F. at the time of operation.

Analyzing the figures from the standpoint of the immediate cause of death, six deaths from peritonitis seems unusually low, and I am inclined to agree with the committee that this is probably incorrect. The death of two patients from postoperative vaginal hemorrhage is rather unusual, particularly in view of the fact that three other patients, who recovered, developed the same complication. The incidence of embolus, five out of forty-seven cases, is quite high, but careful study of the records shows that the diagnosis is definite from the clinical side, and in one instance it was verified by autopsy. In one case in this group the indication for abdominal delivery was an undilatable cervix due to extensive scar tissue, and death occurred on the table, just as the skin sutures were being inserted.

The deaths from rupture of the uterus after cesarean section of course carry their own lesson, that when a woman has once been delivered abdominally, her life is in jeopardy in all future pregnancies unless the utmost watchfulness is practiced throughout her pregnancy and labor. In one of these cases the administration of three doses of pituitrin after hours of hard pains seems an almost inexplicable procedure, and in another instance it is equally difficult to understand

why a patient who had had a markedly febrile convalescence after her former cesarean (for placenta previa) should have been permitted to continue in labor for more than twelve hours before her admission to the hospital; rupture occurred an hour after admission.

For some reason, cesarean section, even when done under the most favorable conditions and as an elective procedure, seems to carry with it a mortality higher than that which accompanies the average operation. Polak estimates it at 2 per cent, but our figures, three out of the fifty-four elective cases in the series, 5.5 per cent, are even higher. One of these patients had multiple fibroids and myomectomy was done; death occurred on the fourth day, apparently from acute dilatation of the stomach, possibly from peritonitis. The second patient had a generally contracted pelvis, and death occurred four hours after operation, from vaginal hemorrhage. The third case should possibly not be classed as elective, since the patient's condition, due to a heart lesion, was bad when operation was undertaken. Even with this case excluded, however, the mortality in the elective group is 3.7 per cent.

In one of the fatalities the technic is described as "extraperitoneal," and the exact nature of the procedure is unknown. In two instances the Porro operation was done, one the case of infected myomata already described, the other a face presentation in which other methods of delivery had failed, including manual rotation of the head, version, forceps and craniotomy. In the latter case, at least, it is doubtful whether any technic could have saved a woman already so frankly infected. All of the other deaths followed the employment of the classical technic. As a matter of interest I might add that during the last two and a half years which the study covers, thirty-one operations were done by the transperitoneal low cervical technic (mainly the laparotrachelotomy described by DeLee), without a single fatality, in spite of the fact that in several instances the patients were undoubtedly infected. Personally I have used only this technic for the last two years, and because of the uniformly successful results I have widened my indications for cesarean section in that I am now delivering patients by this method where once I should not have dared to attempt it.

Glancing at the fetal mortality, one is struck first by the fact that twenty out of the fifty-five deaths, roughly 36 per cent, occurred in premature children. Immediately the question arises whether cesarean section is justified in premature babies. It is, of course, difficult to establish academic rules, but speaking categorically, I would say that it is practically never justifiable under the eighth month, with the possible exception of a central placenta previa, in a primipara, when it may be done at any time, without regard for the child, as a life-saving measure for the mother. Prior to the eighth month the complications of pregnancy, which are mainly hemorrhage and toxemia,

can be better handled from the mother's standpoint by other methods. Moreover, few of them demand prompt evacuation of the uterus, and it is obviously unfair to the mother to subject her to the additional risk which even an elective cesarean implies for the sake of a child whose viability is, at the best, doubtful, since hemorrhage and toxemia are the two conditions which do most to jeopardize the life of the child in utero.

In this series, 20 per cent of the babies born of eclamptic mothers were either stillborn or lived but a few hours, and more than half of them were premature. Thirteen children were lost as a direct result of placenta previa, which is more than 39 per cent, and in two other instances, one of congenital malformation and one of cerebral hemorrhage, this condition was also present, so that the high fetal death rate more than counterbalances the comparatively low death rate of 10 per cent for the mothers. In the instances of premature separation of the placenta the fetal death rate of two-thirds is not surprising; rather it is surprising that any children at all were saved. In rupture of the uterus the death rate of 100 per cent is to be expected.

Of the four congenital malformations, two, a hydrocephalus and an anencephalus, were diagnosed prior to operation, which, as a matter of fact, was done in each instance on the indication of the fetal anomaly. It is hard, in each case, to comprehend the reasons. Delivery by other methods is always possible unless an absolute contraction exists, when craniotomy is warranted, and it seems scarcely fair to subject a woman to the risk of her life for the sake of a child who either cannot live or who will be a congenital idiot. The case of congenital fetal anasarca could scarcely have been diagnosed beforehand; the roentgenogram indicated a marked disproportion between the child, which weighed eleven pounds, and the maternal pelvis, which was of the borderline contracted type, and the patient had lost three previous children. Preoperative diagnosis of the fetal anomaly would, of course, have justified embryotomy. In the fourth case the operation was done for placenta previa, and the fetal condition, an incomplete interventricular septum, was not diagnosed until autopsy.

Table V shows that during the years of this study the maternal and the fetal mortality have been steadily decreasing, from the peak of 26.3 per cent for the mothers in 1922, and 22.2 per cent for the babies in 1923, to 10 per cent for each in 1926. I agree absolutely with the conclusions of the committee that this gratifying improvement is due to three distinct factors. First, eclampsia as a routine indication has been practically eliminated since 1922; the general surgeon and the occasional operator may still be doing cesarean section for this complication, but the obstetrician is not. Second, more and more the tendency is to restrict the operation to absolute indications and to eliminate its promiscuous performance on vague indica-



tions or none at all. Third, the transperitoneal low cervical cesarean section is being more and more widely employed, particularly in cases of frank or suspected infection, and on one or two services it is practically routine.

A study of the comparative fetal and maternal mortality at Charity Hospital, which may fairly be taken as representative, for the last ten years, shows that along with the steadily decreasing fetal and maternal mortality has gone a progressively decreasing incidence for cesarean section, which for the last four years has been approximately 1 per cent. Possibly these two facts are purely coincidental, but I am more inclined to agree with the Committee that the lowered mortality is attributable not only to the fact that we are doing better obstetrics, but also to the fact that we are restricting cesarean section to those cases in which it is really indicated, while at the same time we are not withholding it in those cases in which it should be done.

In spite of a progressive improvement, however, our mortality rates are still too high. When in two hundred ninety-one cases we lose forty-seven mothers, a rate of 16.1 per cent, and fifty-five children, a rate of 18.9 per cent, and when in sixteen of these cases the fatality is a dual one, surely we have no right to congratulate ourselves upon the fact that we did not lose more, which is what a complacent acceptance of the situation really amounts to. Whether women, in order to bring children into the world, should be subjected to a risk of even 10 per cent, which is apparently the best we have to offer them, is certainly a matter for grave soul-searching. My own opinion is that we have no moral right to perform cesarean section on any but absolute and established indications until every possibility of vaginal delivery has been weighed and discarded.

While it is possibly not strictly germane to the subject, these figures suggest one other consideration to me, the matter of prenatal care. How many of these deaths, at least among the mothers, could have been eliminated if such care had been given? Eclampsia is admittedly a preventable complication of pregnancy in all but a minimal number of cases, yet in this small series seventeen women died from it. Pre-eclamptic toxemia can likewise be prevented from becoming acute in a large majority of cases, while in the toxemias due to nephritis, the condition should be recognized and treated long before it becomes acute, even if it means the early interruption of the pregnancy. Patients with contracted pelvises of the borderline type should be given the test of labor only in a hospital with proper aseptic precautions, and patients with absolute contractions should not be permitted to go into labor at all, or should be operated upon immediately after pains have begun, yet a study of these figures shows that repeatedly patients in whom cesarean section was eventually done were permitted to undergo long and exhausting labors, many times with

vaginal manipulations as well, before operation was done as a last desperate resort. And finally, the hemorrhages of pregnancy, while they are not, strictly speaking, preventable conditions, are certainly complications which demand the most careful observation, as well as the prompt termination of the pregnancy, though not usually, as I have already said, by cesarean section.

During this same period, 1921-1926, but not included in this study, nine vaginal cesareans were done in these six New Orleans hospitals, and four postmortem cesareans, and a word concerning them might not be amiss. In the vaginal cases the indications included eclampsia in four cases; preeclamptic toxemia in one; an undilatable cervix due to scar tissue in one (this was a neglected case, admitted after thirty hours of labor, six vaginal examinations, and attempted manual dilatation); central placenta previa in one (this patient died on the table); pernicious vomiting in one (this was practically a postmortem affair, done just previous to the mother's death in an endeavor to save the child, earlier intervention having been repeatedly refused on religious grounds); and abdominal fixation in one (the condition was not recognized, because of an incomplete history, until vaginal manipulations had made an abdominal operation out of the question, and decapitation and embryotomy were necessary before extraction could be completed). The fetal mortality was eight, 88.8 per cent, which is scarcely surprising in view of the fact that most of the pregnancies were of only seven or seven and a half months' duration. Six mothers were lost, 66.6 per cent. These figures are not such as to encourage an extension of this mode of delivery, and as a matter of fact its field is becoming more and more limited. It is never indicated in the hemorrhagic complications, and practically never in eclampsia, now that conservative measures have superseded radical ones. It might, however, be the occasional choice in a multipara previously delivered by abdominal section for other than the absolute indication of contraction, if it were felt that the scar might not hold. The technical difficulties practically always contraindicate its performance in primiparae.

In the four postmortem cesareans the maternal causes of death included toxemia culminating in bronchopneumonia, placenta previa, rupture of the uterus and tetanus. The child born of the toxemic mother lived thirteen hours, the others were stillborn. This operation, while legally justifiable, is really warranted in only a minimal number of cases, since the baby's chances are usually negligible, particularly if the mother has died of either toxemia or hemorrhage.

## THE TOXEMIAS OF PREGNANCY IN RELATION TO CHRONIC CARDIOVASCULAR AND RENAL DISEASE\*

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THE nonsurgical phases of obstetrics should have more attention from the medical practitioner than has heretofore been given. Not only do the medical aspects of childbearing call for unusual skill and discrimination in their management, they also throw light upon certain more general problems in internal medicine. Pregnancy is a great efficiency test of the maternal organism. Being not only a parasite but an activator, the fetus in its growth calls for adaptative changes in all the important organs of the mother. If pregnancy is to proceed normally, this manifold adaptation must be harmonious and coordinated. Many of the pathologic changes of pregnancy having medical interest seem to arise from failure of a given organ or system to do its share in this process. It is probably too much to say that as a woman reacts to pregnancy, so will she react to the general wear and tear of life, but if this dictum is even partially true, the pregnant and parturient woman whose reaction to pregnancy is abnormal should have the benefit of medical as well as surgical supervision.

The so-called toxemias of pregnancy present striking examples of maternal maladaptation to fetal growth. Much effort has been spent in fruitless attempts to isolate a special toxin responsible for these disorders. The attempt to learn what physical type of woman breaks down under stress of pregnancy, what pathologic changes she shows before or during pregnancy and particularly in the months and years following delivery, seems a more promising line of inquiry.

What organs or systems most frequently share in this breakdown? The liver, the kidney, the retina, the cardiovascular and the nervous systems give the most readily demonstrable clinical or necropsy evidence of pathologic change. In pernicious vomiting and acute yellow atrophy the liver seems to bear the brunt of disturbance; in other types of toxemia, the kidney; in others, the cardiovascular system. In eclampsia, the liver and nervous system may be drawn in, together with the cardiovascular and renal systems. Often mixed forms occur which baffle classification and bring up the question as to whether these types are but variants of the same species.

In this paper we shall discuss the examples of maternal maladapta-

\*Read at a meeting of the New York Academy of Medicine, December 21, 1926.

tion to pregnancy that exert important but not exclusive effects upon the kidney and cardiovascular systems. The evidences of these effects which we have thought of value are given in detail.

*Hypertension.*—In a pregnant woman a blood pressure of 140 mm. systolic is considered hypertension. In the antepartum observations pressures were read under the ordinary conditions of an out-patient department or the medical ward and without special precautions as to posture, relaxation, etc. Contrary to the general opinion, it is our experience that the average normal pregnancy is characterized by an arterial *hypotension*. We are convinced, therefore, that the figure cited indicates definite hypertension. In our clinic all cases whose blood pressure reached 140 mm. are especially observed and measures are taken to prevent the development of further toxemia.

*Albuminuria.*—The heat and acetic acid test is used. A flocculent precipitate of any amount is in this report spoken of as a marked albuminuria.

*Nitrogen Retention.*—In a normal pregnancy the nonprotein nitrogen and urea nitrogen are low, figures for the former running about 15.0 to 30.0 mg. per cent. Cases with nonprotein nitrogen above 40 mg. are listed as examples of nitrogen retention. This distinction has been justified by the course of pregnancy in cases of this kind.

*Cardiac Hypertrophy.*—As a rough, practical measure of this, a point of maximum impulse four inches or more from the midsternum is considered as indicating hypertrophy. In the antepartum cases, owing to the rotation of the heart upward and outward by the pregnant uterus, this standard is inaccurate. Postpartum, however, it can be admitted and is found to fit consistently into the picture of cardiovascular changes.

*Arteriosclerosis.*—Sclerosis of the large vessels is judged by the condition of the brachial or radial arteries. To be termed sclerotic a vessel must not only be palpable, it must give an unquestioned impression of increased bulk and firmness. While it is admitted that changes may appear in one part of the vascular field and not in another, the clinician is dependent for direct evidence of pathologic changes in the smaller arteries upon examination of the retina. The changes looked for are constriction of the veins with or without their displacement at the points of crossing of the arteries, a general narrowing of caliber, variation in caliber or contour, hemorrhages, and white patches with or without pigment. Of lesser importance, but of value as accessory evidence, are tortuosity of the vessels and a high arterial light reflex. Such a picture may indicate a real sclerosis of the retinal arteries, or, in some cases at least, a more transient increase in their spasticity. Diffuse edema of the retina is characteristic of some types of toxemia. Patches of exudate such as are usual in albuminuric retinitis are not infrequently seen in toxemia of pregnancy. We have twice observed partial detachment of the retina.

*Edema.*—When not of mechanical, or inflammatory origin, edema is assumed to imply a cardiovascular or renal disturbance.

Rough though such clinical criteria may be, they will serve to throw light upon the reaction of the important systems in question to the stress of pregnancy.

Observations of the cardiovascular-renal status have been recorded throughout pregnancy and in a special follow-up clinic in which patients have been studied from six weeks to six years postpartum. We have attempted by careful questioning and frequent physical examinations to gain an insight into the natural history of this disorder, its

background, earliest manifestations, and development in relation to environmental changes.

Records of prepregnancy observations of these patients have been secured where possible from physicians and hospitals. Some patients have been studied through several pregnancies. In most cases, however, we lacked accurate prepregnancy data.

#### CLASSIFICATION

In our description of the toxemias that seem to affect chiefly the cardiovascular system or the kidney, we have used leading clinical features as the basis of classification. Three clinical forms are thus dealt with.

The first may be called the acute convulsive or eclamptic toxemia; the second, nephritic toxemia; the third, the hypertensive or cardiovascular toxemia. These have many symptoms in common. Headache, visual disturbances, vertigo, vomiting, changed mental states, epigastric pain, jaundice, even convulsions may be present in any type. Hypertension, albuminuria, oliguria, edema, retinal changes may also be found in each. Differentiation depends more upon the severity and time of appearance of certain symptoms than upon their mere presence.

Under convulsive toxemias are grouped all cases which had convulsions. Under the heading nephritic toxemias are placed cases with prolonged and marked albuminuria, or with a nonprotein nitrogen of 40.0 mg. per cent or more in the circulating blood. The remaining cases we speak of as the hypertensive or cardiovascular toxemias. These have hypertension without convulsions and without nitrogen retention or marked and prolonged albuminuria. We have found that examples of essential hypertension existing before pregnancy exhibit this type of toxemia during pregnancy almost without fail. The course of this toxemia during pregnancy and in the follow-up indicates its probable identity with essential hypertension, hyperpiesis or hypertensive cardiovascular disease. That childbearing can reveal essential hypertension when that disorder is latent and aggravate it when it is actively present is a fact that should be recognized by every obstetrician and every internist. The hypertensive and nephritic forms of toxemia are closely related. The difference in their course and prognosis for both mother and child, however, makes their separation desirable on clinical grounds.

This report deals with all cases studied in the follow-up clinic for toxic cases and represents unselected material.

*Acute Convulsive Toxemia: Eclampsia.*—In eclamptic cases of the convulsive type treated at the Sloane Hospital in the last five years, the maternal mortality was 14 per cent. The fetal mortality was 55 per cent for all cases, 72 per cent for the antepartum cases. It is ex-



pected that the routine use of intravenous magnesium sulphate will bring down both maternal and fetal mortality and avert convulsions in many preeclamptic patients.

The pathologic changes are degenerative rather than inflammatory. They are distinctive in the liver, less so in the kidney and the other parenchyma. In this clinical report they need not be given.

Fifty-six cases of convulsive toxemia have been studied. As these are all our cases which had convulsions, they include a few cases in which there was previous chronic cardiovascular disease or nephritis. They should ideally be grouped as (1) acute eclampsia, (2) chronic cardiovascular-renal disease with superimposed eclampsia, and (3) uremia.\* Clinically, it has been impossible to make these distinctions consistently; histories of emergency patients have been unsatisfactory and necropsy material scant. All convulsive cases are, therefore, studied here as a single group. Similarly, the cases often described as preeclamptic, i.e., in which convulsions which seemed impending did not actually occur, are not separately treated. Some of the results may be summarized.

#### I. STATISTICAL STUDY OF CASES OF CONVULSIVE TOXEMIA

*Blood Pressure.*—This was recorded in 56 cases. Hypertension was observed in all but two. In two more the systolic blood pressure did not go above 140. The minimum pressure was 130/70; the maximum 288/190. The average systolic pressure in all cases was 185 mm.; the average diastolic pressure 113 mm.

*The Heart.*—The size of the heart was recorded in 37 cases. Of these 46 per cent showed an apex 4 inches or more from the midsternum. In 54 per cent the point of maximum impulse was mesial to this.

#### II. RETINAL CHANGES

Ophthalmoscopic examinations were recorded in 37 cases. Of these, 65 per cent showed changes of the type already specified. In the remainder the fundus was normal. Among the 24 cases with noticeable alterations in the retinal picture, 22 had edema, 15 changes in the vessels, 12 exudate, 11 hemorrhages, 4 pigmentation, 2 detachment of the retina.

The most characteristic as well as the earliest change is a diffuse edema of the retina. This often precedes by several days the other features listed. Spasticity of vessels, hemorrhage, exudate and pigmentation usually mark the later states of the disturbance.

#### III. EDEMA

In 40 cases there is record in respect to edema. Edema was present in 32 or 78 per cent; absent in 9 or 22 per cent.

\*Stander, H. J., and Peckham, C. H., AM. JOUR. OBST. AND GYNEC., 1926, xl, 583.

TABLE I. CONVULSIVE TOXEMIA

SUBSTANCE	NO. CASES	MAXIMUM	MINIMUM	AVERAGE
Nonprotein Nitrogen	46	173. mg.	20.2 mg.	39.7 mg.
Uric Acid	44	13.7 mg.	1.8 mg.	6.2 mg.
Chlorides (plasma)	17	780. mg.	526. mg.	605. mg.
Calcium	19	10.6 mg.	7.5 mg.	8.8 mg.
Cholesterol	40	723. mg.	106. mg.	315. mg.
Fibrinogen	40	945. mg.	165. mg.	588. mg.
Creatinin	19	3.95 mg.	1.16 mg.	1.68 mg.

*Chemistry of the Blood.*—Our observations are given in Table I.

Our blood chemistry records show an average increase in the uric acid, cholesterol and fibrinogen and a diminution in the calcium.

Of the 56 cases, 8 died, 4 could not be traced. Follow-up observations were made on the remaining 44. Of these 14, or 32 per cent, had persistent hypertension; 15, or 34 per cent, had some degree of albuminuria. In 17 of 28 cases (61 per cent) in which the retina was studied, definite changes of the kind already described were found. Cardiac hypertrophy was found in 14 of 37 cases (38 per cent). Thickening of the large vessels was apparent in 23 per cent. Edema was present in 4 of 41 cases observed (10 per cent).

In other words, more than one-third of these examples of eclampsia showed lasting and sometimes serious signs of disease from six weeks to six years postpartum. These changes were in the cardiovascular-renal system or the retina.

Thirteen of these cases were studied in later pregnancies. None had a repetition of eclampsia, although in one case convulsions were apparently averted by treatment with magnesium sulphate. Five pregnancies were normal. Nine were marked by toxemia. There were two premature macerated fetuses, one premature baby which died shortly after birth, and one four-months' miscarriage. One patient was curetted because of an established chronic nephritis. It is notable that in a consecutive series of 154 toxic multiparae, twenty, or 13 per cent gave a history of convulsions in previous pregnancies.

The question whether the cardiovascular and renal changes found precede and perhaps form a basis of the toxic disturbance, or whether the changes are the result of the eclampsia, cannot be decided from the data at hand. Further medical study of the prepregnancy status of the patients and new functional tests are needed. Our present impression is that many patients showing this disorder during pregnancy have latent disease which is revealed and aggravated by pregnancy.

*Nephritic Toxemia.*—Under this heading we have placed all nonconvulsive cases with a nonprotein nitrogen above 40 mg. per cent and all those with marked and long standing albuminuria. A background of renal disturbance in many of those arbitrarily placed in this nephritic group is suggested by the finding that 19 per cent gave his-

tory of previous renal disease while 52 per cent of the multiparae had had similar disturbances in former pregnancies.

The average age was 29.4 years. In 18 per cent there was history of scarlet fever; in 12 per cent, lues. Eighty-three per cent had poor teeth; 45 per cent had diseased tonsils. There was edema in 81 per cent; headache in 58 per cent; visual disturbances in 60 per cent; vertigo in 31 per cent.

Among the 64 cases the average systolic pressure was 196 mm., the average diastolic pressure, 113 mm. In 9, or 14 per cent, the blood pressure was not above 140 mm. systolic. It is of special interest that only 15 per cent of the cases had a blood pressure above 140 mm. on leaving the hospital two to three weeks postpartum. During a follow-up study over periods of from six months to six years postpartum, however, hypertension was found in 51 per cent of the same group. This confirms an impression that a normal or low blood pressure during the puerperium is no guarantee that hypertension will not reappear during the months or years immediately following.

During the toxemia, the apex of the heart was displaced to the left in 32 per cent of the cases. In the follow-up the corresponding figure was 54 per cent. Edema was present in 81 per cent, while in the group followed up it was found in but 4 per cent. Definite thickening of the brachial or radial arteries was found in 41 per cent of the follow-up group.

The maximum, minimum and average figures for the important chemical findings in the blood are given in Table II.

TABLE II. NEPHRITIC TOXEMIA

SUBSTANCE	NO. CASES	MAXIMUM	MINIMUM	AVERAGE
MG. PER 100 C.C.				
Nonprotein Nitrogen	50	74. mg.	16. mg.	35.2 mg.
Uric Acid	55	8.9 mg.	1.0 mg.	4.3 mg.
Chlorides	15	6.38 mg.	5.1 mg.	594. mg.
Calcium	19	11.56 mg.	7.2 mg.	9.5 mg.
Cholesterol	13	522. mg.	133. mg.	266. mg.
Fibrinogen	44	1110. mg.	325. mg.	573. mg.

As might be anticipated, the patients with nonprotein nitrogen above 40 mg. per cent made the poorest obstetric records. There were 8 such cases. Two of these mothers died within three years, one in uremia and one with pneumonia and nephritis; 6 of 8 fetuses died in utero and were born macerated; 2 were delivered living at term. Of 5 mothers studied at a follow-up clinic, all showed cardiovascular-renal disturbance.

The fetal mortality of the entire group of nephritic toxemia was 47 per cent.

Retinal examination revealed the following: diffuse edema in 40 per cent; retinal exudate, 31 per cent; hemorrhage, 34 per cent;

changes in the vessels, 53 per cent. Some deviation from the normal retinal picture was present antepartum in 66 per cent of all cases in which the retina was examined, while during the follow-up period similar changes were noted in 55 per cent of the cases.

During the toxemia these patients had varying amounts of albumin in the urine from a minimum of a very heavy trace with the heat and acid test to a urine "boiling solid." On discharge from the hospital 24 of 68 cases, or 35 per cent, had a flocculent precipitate of albumin in the urine. During the follow-up period 91 per cent of the 55 cases studied showed albuminuria. This was a flocculent precipitate in 53 per cent. The residual nephritis is very mild but may become severe in another pregnancy, in an infection or other stress.

Table III brings out the interesting point that cases who have had blood pressure of 190 mm. or over show an extremely high fetal mortality, 79 per cent, and a high incidence of lasting disease.

TABLE III. CASES OF NEPHRITIC TOXEMIA  
CARDIOVASCULAR STATUS IN PREGNANCY

BLOOD PRESSURE		CARDIAC HYPERTROPHY			THICKENED LARGE ART.			RETINAL CHANGES			FETAL MORTALITY		
Blood pressure	No. cases	No. cases observed	No. $\bar{c}$ hypertrophy	Per cent $\bar{c}$ hypertrophy	No. cases observed	No. $\bar{c}$ thickening	Per cent $\bar{c}$ thickening	No. cases observed	No. $\bar{c}$ changes	Per cent $\bar{c}$ changes	No. cases observed	No. deaths	Per cent deaths
Under 140	9	8	1	12	4	1	25	6	2	33	9	3	33
140-189	36	33	5	15	20	7	35	17	12	70	36	12	33
190 and over	19	18	13	72	12	7	58	13	10	77	19	15	79
Total	64	59	19	32	36	15	42	36	24	66	64	30	47

The course of this type of toxemia is gradual. At times it seems not to progress but for weeks to remain at a level, with pallor, edema, hypertension and albuminuria. Accidental hemorrhage with premature separation of the placenta may occur. Some degree of anemia is the rule; 32 per cent of our series had a hemoglobin of 70 per cent or less. Ominous symptoms are visual disturbance or an increasing retinitis, which may be asymptomatic or may threaten permanent loss of sight; oliguria or anuria; retention of nonprotein nitrogen in the blood; deviation from normal mentality; epigastric pain; heightened reflex activity or convulsions. The latter are infrequent, late and are probably uremic in character. When any of these do not yield to treatment, the uterus must be emptied.

The maternal mortality in this variety of toxemia is not high.

Among our 64 cases there were no deaths in the hospital and but two in the follow-up period.

The result of repeated pregnancies in women who have shown this "nephritic" type of toxemia is a matter of importance. In our series 12 were observed in subsequent pregnancies. Of these, 5 attempts at reproduction were unsuccessful, resulting in fetal death.

TABLE IV. CASES OF NEPHRITIC TOXEMIA  
CARDIOVASCULAR STATUS IN FOLLOW-UP

BLOOD PRESSURE IN PREGNANCY		CARDIAC HYPERTROPHY			THICKENED LARGE ART.			RETINAL CHANGES			HYPER- TENSION			MARKED ALBUMIN		
Blood Pressure	No. cases	No. cases observed	No. $\bar{c}$ hypertrophy	Per cent $\bar{c}$ hypertrophy	No. cases observed	No. $\bar{c}$ thickening	Per cent $\bar{c}$ thickening	No. cases observed	No. $\bar{c}$ changes	Per cent $\bar{c}$ changes	No. cases observed	No. $\bar{c}$ hypertension	Per cent $\bar{c}$ hypertension	No. cases observed	No. $\bar{c}$ marked albumin	Per cent $\bar{c}$ marked albumin
Under 140	9	7	3	43	5	1	20	5	1	20	7	0	0	5	3	10
140-189	36	26	11	42	18	7	39	18	8	45	35	17	49	33	18	54
190 and over	19	17	13	76	11	6	54	13	11	85	15	12	80	17	8	47
Total																

In summary, then, patients showing marked and persistent albuminuria or retention of nitrogen during pregnancy, had a 50 per cent chance of fetal survival. About 60 per cent of the cases showed persistent renal or cardiovascular changes of importance during the years immediately following the pregnancy with toxic symptoms. It seems probable that pregnancy has an adverse effect upon cases of this character, reducing the factor of safety in their renal and cardiovascular systems. Therefore, repeated pregnancies are undesirable from the standpoint of maternal health and likely to be unprofitable because of the great liability to fetal death. It seems probable that an underlying chronic defect exists in these cases, a defect revealed and aggravated by the stress of reproduction.

*Hypertensive Type of Toxemia of Pregnancy.*—In this, the third and most common type of toxemia, the chief symptom is hypertension. Cases who have rise in blood pressure without convulsions or evidence of marked renal irritation or insufficiency have been considered separately because in course, prognosis and treatment, they differ from the eclamptic or nephritic groups.

While hypertension may precede the pregnancy, it usually appears toward the later months and becomes gradually more marked as time goes on; it is often the sole discoverable evidence of trouble. Usually, however, when a pressure of 180 mm. is reached, some degree of albu-



minuria appears. This may be followed by edema and oliguria, rarely by icterus and convulsions; i.e., the picture changes to that described as nephritic or convulsive toxemia. Placental separation and fetal death with later delivery of a macerated fetus often occur in the later development of this picture.

With intrauterine death of the fetus or its delivery, the blood pressure usually falls and the medical attendant is lured into a false sense of security, believing that the hypertension is at an end. Continued observation proves that many of these women will, within a few weeks or months postpartum, have a renewed rise in pressure which may be enduring. In addition, other stigmata of chronic cardiovascular disturbance may be detected. This fact has not had due recognition.

Many show cardiovascular disease early in pregnancy. Cardiac hypertrophy, thickening of brachial or radial arteries, spastic or sclerotic changes in the arteries of the retina are present in a large percentage. Of 175 cases observed antepartum, 23 per cent showed cardiac hypertrophy; 27 per cent thickening of the brachial arteries; 55 per cent changes in the vessels of the retina. Such findings suggest that many of these patients had cardiovascular changes before pregnancy.

The laboratory findings are not distinctive. In addition to the tardy albuminuria which may become extreme when matters become serious for the mother, casts may appear. In most instances the uric acid of the blood is moderately raised; urea and nonprotein nitrogen remain at their normally low point for the pregnant woman. The chlorides are not increased.

The fetal mortality was 15 per cent. There were no maternal deaths.

TABLE V. CASES OF HYPERTENSIVE TOXEMIA  
CARDIOVASCULAR STATUS IN PREGNANCY

BLOOD PRESSURE		CARDIAC HYPERTROPHY			THICKENED LARGE ART.			RETINAL CHANGES			FETAL MORTALITY		
Blood Pressure	No. cases	No. cases observed	No. $\bar{e}$ hypertrophy	Per cent $\bar{e}$ hypertrophy	No. cases observed	No. $\bar{e}$ thickening	Per cent $\bar{e}$ thickening	No. cases observed	No. $\bar{e}$ changes	Per cent $\bar{e}$ changes	No. cases observed	No. deaths	Per cent deaths
140-149	42	42	5	12	24	6	25	16	10	62	40	2	5
150-159	50	48	6	12	30	3	10	18	7	9	49	4	9
160-169	32	29	8	28	16	3	19	14	8	57	31	6	20
170-179	18	17	4	23	13	4	33	11	4	36	17	2	12
180-189	15	14	5	36	10	6	60	8	5	62	14	4	29
190-199	5	5	1	20	--	--	--	4	3	75	5	3	60
200-200 +	13	13	11	84	9	6	66	9	7	77	12	4	33
Total	175	168	40	23	102	28	27	80	44	55	168	25	14.8

Follow-up studies of 175 cases have brought out some important facts. These patients were observed at intervals varying from six weeks to six years postpartum, the average follow-up period being about two years. Of these, 40 per cent showed blood pressures above 140 mm. In general the percentage of those showing hypertension postpartum was larger among those having the higher blood pressure during pregnancy.

TABLE VI. CASES OF HYPERTENSIVE TOXEMIA  
CARDIOVASCULAR STATUS IN FOLLOW-UP

BLOOD PRESSURE IN PREGNANCY		HYPER- TENSION			CARDIAC HYPERTR.			THICKENED LARGE ART.			RETINAL CHANGES			SUMMARY ANY CHANGES		
Blood Pressure	No. cases	No. cases observed			No. cases observed			No. cases observed			No. cases observed			No. cases observed		
		No. $\bar{e}$ hypertension			No. $\bar{e}$ hypertrophy			No. $\bar{e}$ thickening			No. $\bar{e}$ changes			No. abnormal		
		Per cent $\bar{e}$ hypertension			Per cent $\bar{e}$ hypertrophy			Per cent $\bar{e}$ thickening			Per cent $\bar{e}$ changes			Per cent abnormal		
140-149	42	41	9	22	39	16	41	84	12	35	30	17	57	42	30	71
150-159	50	50	10	20	47	14	30	38	7	18	38	21	55	50	31	62
160-169	32	30	13	43	29	13	45	24	6	25	21	12	57	32	25	80
170-179	18	18	11	61	16	3	19	14	9	64	10	6	60	18	15	83
180-189	15	15	9	60	13	6	46	12	6	50	12	9	75	15	12	80
190-199	5	5	4	80	4	3	75	4	1	25	4	3	75	5	4	80
200-200 +	13	13	11	84	11	7	64	9	5	55	11	11	100	13	13	100
Total	175	172	67	40	159	62	40	135	46	34	126	79	63	175	130	74

It is of interest to note the high incidence of cardiovascular changes (71 per cent) in the group of cases with pressures only slightly above the normal.

Sixty-three of these patients who have recently gone through pregnancies with this type of toxemia have been observed in this hospital in one or more preceding or subsequent pregnancies. The number of the pregnancies observed here has varied from two to six per patient and the period of years over which their records extend varies from two to twenty-three. Thirty-three of these women have been observed during pregnancies over a period of more than five years and fourteen of them over a period of more than ten years. It has, therefore, been possible to estimate whether a woman who has once suffered this type of toxemia is liable to develop it in subsequent pregnancies.

Eleven of the sixty-three cases showed hypertension only in the last of a series of pregnancies, and it is still to be observed how they will react in the future. Fifty-two of them, however, were observed in pregnancies subsequent to the one in which they first developed toxemia, and of these, fifty, or 96 per cent, had a recurrence of some grade of hypertension. In 21 of these cases there was a tendency for

the disease to become more severe; in 16, the blood pressure reached about the same figures; while in only 6 was the blood pressure progressively lower in the later pregnancies. Of 44 of the 63 patients observed in follow-up when not pregnant, 27, or 61 per cent, had blood pressure above 140. Of the 50 patients who had hypertension in two or more pregnancies, 27 were seen in follow-up, and of these, 21, or 78 per cent, had blood pressure above 140. These data indicate that a woman who has once exhibited hypertension in pregnancy is liable in subsequent pregnancies to show a similar or more advanced disturbance, and that as pregnancies are repeated, she tends to maintain a hypertension in the nonpregnant state as well.

Of the total 230 pregnancies carried five or more months by this group of women, 34, or 15 per cent, ended as stillbirths. One woman had eight and another five stillbirths; if we except these, and five others presumably referable to syphilis, we have 16, or 7.0 per cent, for the remaining women. This incidence is lower than that for our series in whom evidences of renal disturbance were present.

Again, in women with hypertensive cardiovascular disease antedating pregnancy, it can be predicted with great precision that toxic symptoms will occur and become increasingly severe during the later months. Very few women who begin pregnancy with blood pressures above 150 systolic or 100 diastolic can go through pregnancy successfully; that is, with a living child. It is our opinion, moreover, that pregnancy does much to accelerate the progress of chronic cardiovascular disease, that it may bring it out when latent, and is to be avoided when the disorder has made evident inroads.

*Treatment.*—Although apart from the chief object of this paper, a résumé of our experience in the medical treatment of these types of toxemia of pregnancy may be helpful. Most important is prevention. Among the clientele of a good antenatal clinic, the acute forms of toxemia are very rare. Attention to diet, to the patient's weight, her digestion and excretion, the elimination of nervous and mental strain, the care of foci of infection, the treatment of defects in the endocrine glands when possible—these are of great importance in warding off toxemia.

The general treatment of all forms of toxemia described includes the following: Mental and physical rest are enforced. The diet is low in protein and salt and contains a large amount of carbohydrate and an ordinary amount of fat. Elimination is encouraged by bowel and skin. When needed, relaxation is secured by sedatives. The most reliable of these are the bromides, chloral, paraldehyde, morphine and sulphate of magnesia. If convulsions occur, or if restlessness, mental aberration or increased activity of the deep reflexes seem to indicate that they impend, an intravenous injection of magnesium sulphate, 25 c.c. of a 10 per cent solution, should be given.

This is usually followed by a cessation of the convulsion, relaxation, a lowering of blood pressure and diuresis. Prompt relief of headache often occurs. This measure can be repeated frequently if there is need. Given slowly there is little danger of collapse. If magnesium sulphate is not available, morphine in large amounts is well tolerated.

In acute convulsive toxemia, attempts to hasten delivery of the fetus by mechanical interference are usually unwise. These place an extra burden on the mother at a time when such is ill borne. The object of treatment is the control of convulsions until a spontaneous delivery takes place. Barring obstetric obstacles, this is to be looked for.

Since eclampsia is not likely to recur in later pregnancies, it need not discourage future attempts at childbearing. The patient should be observed in the interval, however, for signs of chronic cardiovascular disease.

The management of the nephritic type of toxemia is that of an acute or subacute nephritis plus pregnancy. Often the patient can be carried along until viability or term despite hypertesion, edema and ried along until viability or term despite hypertension, edema and albuminuria. In the presence of unyielding nephritis, the uterus should be emptied as soon after viability of the fetus as seems wise; without any delay and without regard for the fetus if the mother's symptoms are serious. The unfortunate result of later pregnancies in women who react in this way to childbearing has already been discussed.

The hypertensive type of toxemia is slow in development and seldom offers an emergency. The problem is that of the management of hypertensive cardiovascular disease and pregnancy. Chloral hydrate is valuable in bringing about relaxation and can be used freely over long periods.

The fetus is comparatively safe during the earlier part of the toxemia. If the pressure rises above 180 mm. and if there is also notable albuminuria, there is great danger of fetal death. This danger seems increased in mothers with well-marked changes in the general cardiovascular field. In conditions such as these, early induction of labor may be considered.

Women with persistent systolic pressure above 150, and diastolic pressure above 100, at the beginning of pregnancy are not likely to go through pregnancy successfully. This is particularly the case when changes in the retinal vessels give hint of a probable "arterio-capillary fibrosis." In such, abortion is usually wise, since it spares the maternal cardiovascular system the certain damage of pregnancy. If the woman is so eager for offspring as to be willing to pay the price and run the risk of an unsuccessful pregnancy, she may be encouraged to carry on if the vascular changes are not too well marked. Rest in bed for weeks or months may be required. As a rare exception, a

woman with pressures approaching 200 and with corresponding arterial changes will bear a normal child even after previous failure.

*Discussion.*—Can any conclusions be drawn as to the general nature of the toxemias of pregnancy? None that are more than tentative; few that have support more firm than that of impression and opinion. The result of seven years of clinical study of these conditions is the impression that there are two great classes of toxemia of pregnancy. The first includes pernicious vomiting and acute yellow atrophy of the liver; the second includes the eclamptic, nephritic and hypertensive forms of toxemia which we have discussed. These last three seem allied in many respects. The majority of women with these disturbances have a peculiar bodily habitus. They are large, overweight, with heavy muscles, thick skin, large features, with hands of a broad, square pattern, not infrequently a masculine crines and spaced incisor teeth.

Draper, in an anthropometric study of 117 of our cases, found that the dominant type among them indicated past activity of the anterior lobe of the pituitary gland, in other words, acromegaly. There is a common symptomatology and similar pathologic changes appear in the cardiovascular-renal field during the follow-up period. Clinical study thus far seems to point to a common source of these disturbances.

It is our belief that search for a single cause like a toxin may continue to end in failure. There is promise that solution of the riddle of the toxemias of pregnancy may be found by study along less narrow lines. Such study must include knowledge of the type of woman who reacts thus adversely to the strain of reproduction and a detailed study of her functional and structural deficiencies, both before and after childbearing. We are convinced that defects of importance can be uncovered in a majority of women who have or who have recently had a toxemia of pregnancy. The defects which are most common and the easiest to show are in the cardiovascular-renal field. We believe that a large proportion of these women have an underlying disease which is brought to light or aggravated by pregnancy. We believe that it is possible to predict with considerable accuracy the reaction to pregnancy of such women. It is our opinion that observations on these so-called toxemias of pregnancy have bearing upon the general problem of the cardiovascular-renal diseases.

#### SUMMARY AND CONCLUSIONS

The late toxemias of pregnancy represent failure of a defective maternal cardiovascular-renal system to adapt itself to the strain of childbearing. They interest the medical practitioner as early examples of disorder in this system and also as indicators of latent weakness which will reappear in later life.



Two hundred and ninety-one cases were studied at the Sloane Hospital for Women. They are classified as (1) acute convulsive toxemias, (2) nephritic toxemias, marked by long-continued albuminuria or relative nitrogen retention, and (3) hypertensive toxemias, a group of cases characterized by hypertension without marked albuminuria and set apart because of its resemblance to "essential hypertension."

The cases were studied with special reference to the cardiovascular-renal status in the antepartum clinic and wards and later in a follow-up clinic over periods varying from six weeks to six years postpartum. The tabulated observations show that cardiac hypertrophy, thickening of the brachial and radial arteries and certain eye-ground changes were present in a large proportion of these cases during the toxemia (this suggests that some disorder antedated pregnancy) and also during the follow-up period. Hypertension persisting for months or years was found in one-third of the cases of eclampsia, one-half of the cases of nephritic toxemia and two-fifths of the cases of hypertensive toxemia. One-half of the nephritic group showed marked albuminuria in the follow-up period.

Fetal mortality in the eclamptic group was 55 per cent, in the nephritic group 47 per cent, and in the hypertensive group 15 per cent.

Both the fetal mortality and the later incidence of signs of persistent disease were greater in those cases showing the higher blood pressure readings during pregnancy.

These types of toxemia are, therefore, not mere complications of pregnancy. It is probable that pregnancy reveals rather than causes the disease. The behavior of a woman's cardiovascular-renal system in pregnancy gives to the physician a valuable hint as to what may be expected of it under subsequent stresses and strains.

Search for a single toxin as the cause of these toxemias may continue to be fruitless. Much may be learned, however, by a broad study of the woman who makes this abnormal response to pregnancy.

49 EAST FIFTY-THIRD STREET.

## A CASE OF HUMAN CYCLOPIA RESEMBLING ANOPHTHALMIA

BY CARL BACHMAN, M.D., PHILADELPHIA, PA.

(From the Obstetric Clinic of Dr. Barton Cooke Hirst, Hospital of the University of Pennsylvania)

RECENT literature contains few case reports either of anophthalmia or of human cyclopic monsters. With cyclopia, this may be due to cases being seen and not reported, since Hannover's<sup>7</sup> tabulation of 109 cases in 1882 has shown it to be a comparatively frequent type of monstrosity in man. The artificial production of these monsters in lower orders has likewise been frequently accomplished by teratologists.<sup>15</sup> There are interesting features in the case which I wish to report, making it desirable to record the data obtained despite omissions due to failure to secure a postmortem pathologic examination.

The maternal history is given in detail in order to present all the facts for their possible etiologic significance.

Mrs. A. H., housewife, aged 21, Jewish, was registered at the Pre-Natal Clinic of the University Hospital May 14, 1926.

*Clinical History.*—Had been healthy all her life except for a mild varicella as a child in Russia, and scarlatina at ten years of age. Family history, as also that of her husband, contained no instances of monstrosities or idiocy. Husband healthy and an abstainer from alcoholic liquors.

*Obstetric History.*—Married eighteen months. Had one spontaneous miscarriage at four months, fifteen months ago, requiring hospitalization and evacuation of the uterus with placental forceps.

*Present Pregnancy.*—Last normal menstrual period July 27, 1925. The patient then had a "one-day period" September 19, 1925, but noted none of the subjective phenomena of early pregnancy either before or immediately following this. Had no nausea, and failed to note the date of the first fetal movements. Had been feeling well.

First examination: Weight 138 pounds. General appearance of good health; sluggish mentality. Blood pressure, 130 systolic; 80 diastolic. Fundus uteri soft and cystic, extending about 4 cm. above the umbilicus; excess of amniotic fluid suggested. Fetus small, head down and entering pelvis; back to left, fetal heart sounds below and to the left of the umbilicus. Placental bruit not noted. Pelvic measurements above normal limits, and vaginal examination negative for abnormal features. In view of these findings term was calculated from the September "period," and was expected June 26, 1926.

The patient made one more prenatal visit on June 2, at which time the fundus was about 6 cm. above the umbilicus. The increased amount of amniotic fluid made the diagnosis of fetal position less certain at this time, but the head was well into the pelvis. The patient was feeling well. Urinalysis and blood Wassermann were negative.

Labor progressed normally and delivery occurred rapidly and spontaneously, with the occiput emerging anteriorly. The cord was beating normally. No anomalies

of labor were noted; there was no evidence of a low placentation, and routine examination of the cord and placenta disclosed no abnormalities or gross infarcts. The child breathed immediately, although with obvious difficulty, and with an obstructive type of dyspnea due in part to a curtain-like flapping of the upper lip during respiration. Cyanosis was marked.

The puerperium was entirely without event. The child lived nine hours, supported mainly by continuous oxygen feeding and various stimulants. During this time respirations were regularly and properly timed, although extremely labored. Cyanosis persisted. There was no suggestion of intracranial or medullary hemorrhage, and careful examination failed to disclose pulmonary atelectasis or other



Fig. 1.—Case of human cyclopa. Full face view shows incomplete descent and separation of the orbits, corresponding to faulty development of the frontonasal process. The result is a long nose, with the septum not united with the floor of the nares (maxillary processes), and the face as a whole suggesting the features of adult maturity. The orbits are shallow, and the eyeballs are missing to gross examination. There is but one median nostril.

cause for the cyanosis. The obstructive type of dyspnea was obvious, but the obstruction interposed by the upper lip was also obviously not the sole cause of the difficulty.

*Description of Specimen.*—Owing to the precarious state of the child's health, incidental observations of its deformity were necessarily limited during life. Necropsy or preservation of the body was strenuously refused.

Weight, 2670 gm. Estimated length of gestation about eight months. The neck, trunk and extremities appear to be everywhere fully developed and practically mature. The skin is smooth and shiny, and covered with lanugo. The cranial

bones are firm and closely apposed along the sutures. The hair of the head is from 2 to 3 cm. in length. The nails of the fingers and toes project beyond the digits.

The head is not disproportionately small except for an obvious contraction of the frontooccipital diameter. Symmetry is present throughout. The anterior fontanelle measures less than 2 by 3 cm. The striking features of the face are the relatively high situation of the orbits, and their close approximation, giving the appearance of adult maturity. The nose is correspondingly longer than normal, the extra length being apportioned half between bone and cartilage, the latter hanging rather loosely from the bony bridge. The nose terminates below in a single, median nostril, about 4 mm. in diameter, flanked by flattened alae. Specular examination of the nares discloses no union of septum with floor. The superior maxillae are firmly united in the midline, as are also the bony palatal processes,



Fig. 2.—Case of human cyclopia. Profile is that of an adult. Diminished fronto-occipital diameter, due to shallowness of anterior fossa of the skull.

although the latter are ridged longitudinally, parallel to the alveolar processes. The eyelids are tightly closed but not fused. The eyelashes are normally formed. The orbits are extremely shallow, and eyeballs can neither be palpated against the bony orbits, nor demonstrated by prying open the eyelids. The conjunctival sacs appear to be lined by mucous membrane, which at the time of death has thrown off a thick mucoid secretion.

The spine, anus and genitalia appear normal.

*Roentgenograms.*—The outstanding features are: The shallowness of the anterior fossa of the skull, and the elevation, approximation and shallowness of the orbits. The superior maxillae appear to be fully and normally developed. The antra and the bony septum of the nose are present. The remainder of the skeleton is normally developed, although there is increased condensation of all long bones.

*Cord Wassermann.*—Negative.

## COMMENT

An interesting speculation arises in accounting for this specimen either as an example of anophthalmia or as a variant of the group of cyclopic monsters. Popular conception pictures cyclops in the more classical and spectacular form of a single median-eyed individual, whereas the teratologists have shown this type of monstrosity to embrace many grades of incomplete duplicity of the eyes.

A difficulty is the lack of data, which a postmortem examination would have supplied, concerning the state of the visual apparatus within the skull, and the condition of the frontal lobes and lateral ventricles of the brain, and the floor of the anterior fossa. The literature contains records of total congenital absence of the visual apparatus, without associated changes in the orbits or other derivatives of the primitive frontonasal and maxillary processes, the ultimate form of which is believed to be dependent upon the primary development

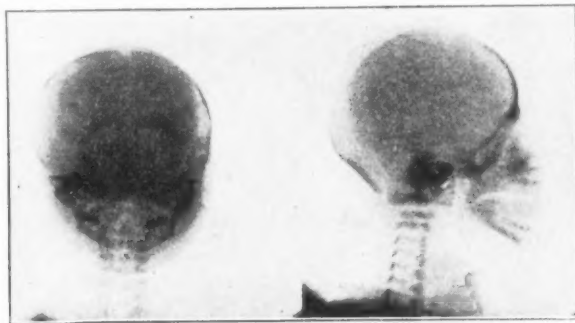


Fig. 3.—Case of human cyclopia. The roentgenologic features are (1) shallowness of the anterior fossa of the skull, and (2) elevation, approximation and shallowness of the orbits.

of the optic "anlage."<sup>8</sup> Unfortunately such reports are mainly neurologic studies, and observations bearing upon the possible teratologic relationship of anophthalmia to cyclopia are wanting. Both Spiller's<sup>14</sup> case and the case of Haab, quoted by Spiller, lived a number of years exhibiting other abnormalities, chiefly peripheral spasticities referable to the central nervous system, but without deformity of the frontal lobes, the face, or anterior portion of the skull. It is possible that some of these cases represent the result of regressive or atrophic processes in the retina and optic tracts, from syphilitic or other intra-uterine disease occurring at a later date in embryonic life than the extremely early periods ascribed to the "developmental arrests."<sup>7, 8, 11</sup> responsible for cyclopia.

On the other hand, the examples of cyclopia described in humans<sup>2, 8, 11</sup> and those produced experimentally in lower orders<sup>15</sup> seem to present more or less mature vestiges of the whole visual apparatus,



whatever the variety or degree of duplicity or unity within the system, thus indicating early perversion of development rather than secondary decay. Around the defective visual organs the "nonocular" material is vested, taking form according to the degree of separation of the various structures of the eye, the frontonasal process descending in a general way in proportion to the degree of this separation. True human cyclopic monsters apparently do not survive.

The possible varieties of cyclopia are therefore legion. The attempt of Saint-Hilaire in 1832<sup>12, 13</sup> to establish five "species" in the human was followed by more elastic schemes proposed in 1880 by Ahlfeld<sup>1</sup> and in 1900 by Bock;<sup>9</sup> it is not unlikely the numerous variants suggested by modern experimental work renders inadequate all subdivisions within the general class or group "Cyclopia." The specimen described is believed to belong to this group of beings, despite the fact that the defects are apparently minimal, and might be consistent with a viable and deformed, rather than monstrous, individual. It approximates very closely the first type described by Bock, the case of Hecker and Buhl illustrated by Hirst and Piersol,<sup>10</sup> and Saint-Hilaire's "Ceboccephalus" of which only six instances were recorded prior to 1885 according to Dareste.<sup>5</sup>

The literature of cyclopia has been amply compiled in the more recent reviews included in the appended references.

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## CORTICAL NECROSIS OF THE KIDNEYS IN PREGNANCY

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**S**YMMETRIC cortical necrosis of the kidneys is a rare condition. A review of the literature reveals about twenty cases in all,—some reported under the heading of degenerative nephritis, including those of Lloyd, Jardine and Teacher, Jardine and Kennedy, Rolleston, Glynn and Briggs, Carson and Rockwood and that of John C. Hirst.

Cortical necrosis is probably due to a metabolic poison associated with pregnancy. Most cases occur in the latter half of pregnancy and invariably there is a premature labor with a stillborn baby. In only one case on record was there a live birth. It may also be associated with severe late toxemias with or without an underlying nephritis.

The capsules of the kidneys strip easily. The kidneys are about one and one-half times the normal size. The surface is covered with yellowish areas, some of them markedly softened and containing purulent or caseous material according to whether secondary infection is present or not. Between the yellow areas there are small red areas due to dilated capillaries and small petechial hemorrhages. On section there are numerous yellowish streaks connecting the cortex and medulla. Necrosis and purulent infiltration is most extensive in the cortical substance.

Microscopically, the capsule is thickened and the underlying tissue stains poorly but in some areas the capsules of Bowman and the glomerular tufts can be made out clearly. The capsules of Bowman in other areas are thickened and their connective tissue cells stain poorly. Many areas throughout the cortex show diffuse coagulation necrosis. The interlobular arteries show a shedding of the endothelium, the lumen filled with blood platelets. A moderate leucocytic infiltration is present in the corticomedullary zone.

The onset is usually sudden, with no definite train of symptoms. There may be nausea, vomiting and headache. The patient is pale; puffiness of the face and swelling of the ankles may be the first signs which lead the examiner to suspect the kidneys. The temperature is usually normal unless secondary infection is present. In some cases the patient may be disoriented, with failing memory and irrationality, but usually the mind is clear until just before the end, when the patient mutters in a noisy delirium, becomes quite drowsy and fibrillary twitchings of the face and extremities occur. Definite convulsions are not the rule.

The most characteristic symptoms are the urinary changes. At first there may be nocturia followed by oliguria, and finally complete anuria. The urine is scanty, high colored and contains albumin, blood and tube casts, both hyaline and granular. The specific gravity is high, the quantity reduced and only 15-30 c.c. may be passed in twenty-four hours. On standing there is a heavy deposit. Microscopically there are a few blood corpuscles but numerous epithelial cells, pus cells, hyaline and granular casts. Albumin is abundant, forming a curdy, thick precipitate.

Edema is an early symptom, but usually not very marked. As the case progresses, effusion may take place into the pleura. The lungs become edematous. The pulse is rapid, and when the tension is increased, the aortic second sound is accentuated. The blood pressure may be very variable. It may be slightly raised or the systolic pressure may reach 200 or more.

Uremic symptoms may occur just before death. In some cases there is marked edema of the optic discs. Towards the end the breathing is the Cheyne-Stokes type. The lungs show signs of dullness over the bases and numerous coarse râles are present over the entire chest.

Blood examination shows a leucocytosis and marked reduction of the red blood cells. Creatinin and urea are increased. The  $\text{CO}_2$  tension of the blood plasma is lowered.

The prognosis is extremely grave. Death is caused by edema of the lungs and cardiac failure, or the patient may die in convulsions.

#### REPORT OF CASE

Mrs. R. J. B., aged 38, primipara, was admitted to St. Mary's Hospital, December 10, 1926, in the eighth month of pregnancy, because she thought she was in labor.

She had been well during her pregnancy. Thirteen days before admission to the hospital the patient was apparently in good health and examination showed her urine and blood pressure to be normal. When admitted she was pale, suffering severe pain in the abdomen, notwithstanding a hypodermic injection of morphine and hyoscine. Her pulse was 130, and quite weak, respiration was sighing, 35 per minute, temperature  $97^\circ \text{F}$ . The skin was cold and clammy. Chest findings were negative. There was considerable abdominal distension. The uterus was in a state of tetanic contraction, very hard and excessively tender. Rectal examination revealed a uterus with cervix almost effaced but with no dilatation. There was no vaginal bleeding. W.B.C. 20,000. Hgb. 50 per cent. The urine was straw colored, acid, and the catheterized specimen contained four plus albumin, a moderate amount of hyaline and granular casts, a few pus clumps and a few R.B.C. At 10:30 A.M. the patient was worse, the uterus was decidedly larger and more tense. The patient was in shock with a rapid weak pulse and increased pallor. No fetal heart tones could be heard, and there was still no dilatation of the cervix. A diagnosis of concealed hemorrhage, abruptio placenta and toxemia of pregnancy with dead baby was made. On the face of the clinical findings it was decided that cesarean section was the quickest and safest way to empty the uterus.

The patient was given a 1/6 grain of morphine and hyoscine, 1/200 grain. A classical cesarean section was done in the usual manner. The uterus was found distended with blood, the placenta was detached and there was a well-marked hemorrhagic infiltration of the muscles of the uterine wall. The baby was dead but not macerated.

The patient showed signs of considerable shock at this time and was given 500 c.c. of glucose solution with insulin before leaving the table.

The patient lived 12 days after the operation. For the first few days the general condition was remarkably good. The abdominal distention subsided promptly, after the fourth day she took fluids and milk freely, also small amounts of toast, crackers, etc. From the sixth day until death she suffered from abdominal cramps associated with profuse watery bowel movements. She also had profuse sweats. She had no convulsions but was almost comatose the last three days and had twitchings of her facial muscles. There was only a slight edema of the legs and face.

She was given 500 c.c. of citrated blood intravenously four hours after the operation and almost daily intravenous injections of saline or glucose combined with insulin on a few occasions. She had several blood transfusions and on three of these occasions a nearly equal amount of the patient's blood was removed before the new blood was given. None of these measures had other than a temporary supportive effect.

Her temperature ranged from 99° to 101°. There was almost a total anuria for 12 days, the total urinary secretion for that time being only 851 c.c., or an average of about 70 c.c. per day. The urine contained a large amount of albumin and pus, with hyaline and granular casts. Her blood pressure was fairly constant at 150/78, till just before death. The leucocyte count ranged from 20,000 to 26,000, the R.B.C. 3,000,000 and the hemoglobin about 50 per cent, occasionally being higher right after a blood transfusion. The CO<sub>2</sub> combining power of the blood plasma was reduced to 21.4 on the fifth day. The blood chemistry showed a constantly increasing nitrogen retention. The creatinin rose from 4.8 mg. the day following the operation to 12.5 mg. the last four days before death. It did not go higher. The urea-nitrogen rose to 75 mg. and sugar to 0.187 per cent.

At autopsy the abdominal cavity contained some slightly cloudy fluid. The anterior surface of the uterus showed the recent incision with the sutures firmly in place. The serosa was very congested, glistening and small fibrinous deposits were seen around the stitches.

Upon opening the thoracic cavity both lungs, especially the right, showed extensive fibrous adhesions. There was considerable congestion and edema at the bases. A small calcareous nodule was present in one of the hilus glands. The bronchi contained considerable watery mucoid material.

The pericardial cavity contained about 10 c.c. of clear serous fluid. The heart was distended and filled with dark fluid blood. Considerable arteriosclerotic changes were present in the mitral and aortic valves. The coronary vessels showed a few yellowish patches. The myocardium was cloudy.

The spleen was quite congested and twice the normal size. The adrenals were edematous and rich in lipoids. The fallopian tubes and ovaries were somewhat edematous. One of the ovaries showed rests of a large corpus luteum. The uterus on the inside was uneven and showed necrotic areas. The liver was about normal in size and on cut surface the tissue was cloudy and showed marked central stasis. There was congestion of the pancreas. The stomach contained greenish mucous fluid and the mucosa showed numerous small hemorrhages. The intestines were thickened by an edematous infiltration.

The kidneys were about one and a half times larger than normal. The surface was studded with yellowish areas, some of them with definite purulent softening. The capsules of the kidneys stripped easily. On cut section there were numerous purulent streaks running through the medulla and cortical substances, connecting the cortex with the pelvis of the kidney. The necrosis and purulent infiltration was most extensive in the cortical substance. An area of the cortex, about 1.5 mm. thick, just beneath the capsule was better preserved. The pelves of both kidneys and ureters were filled with purulent urine.

Extensive areas of the kidney cortex were completely necrotic. The glomeruli were transformed into amorphous masses which stained irregularly with eosin. No capillaries could be recognized. The lining epithelial cells were swollen and not definitely defined. Their nuclei stained poorly and can hardly be recognized. The lumen of the tubules was narrowed by the swollen epithelial cells and many of the tubules were filled with coagulated albuminous material and a few polymorphonuclear cells. The cells of the interstitial connective tissue had lost their staining properties, and occasionally a pyknotic nucleus could be recognized. The necrotic areas of interstitial tissue were densely infiltrated with p.m.n.'s. Just beneath the capsule the cortex was not entirely necrotic but extremely congested. In some areas the glomeruli showed a beginning necrobiosis. Here the capillary loops were considerably distended and filled with red cells. In other glomeruli a proliferation of the nuclei could be seen. In this region the tubules were either empty or filled with coagulated albuminous material, hyaline or purulent casts. The interstitial connective tissue showed slight proliferation, marked edema, and often dense infiltration with diffuse hemorrhages.

The medullary substance was extremely congested. The tubuli recti were distended, most of them filled with pus.

*Anatomic Diagnosis.*—Endometritis, purulent pyelonephritis with cortical necrosis, cloudy swelling of kidneys, liver and myocardium, old fibrous adhesions, adhesions of the pleura, acute congestion of the spleen, dilatation of the heart, edema of the lungs.

#### SUMMARY AND CONCLUSIONS

1. Patient a primipara, eight months' pregnant, apparently in good health until the sudden onset of the disease.
2. The case was complicated by a concealed hemorrhage, caused by the toxemia.
3. Cesarean section was done in hopes of saving the mother.
4. Patient looked and felt remarkably well considering that there was almost a total anuria for twelve days with only 831 c.c of urine passed during this period.
5. It is surprising that the creatinin and urea in the blood were not higher considering the small amount of functioning kidney substance found at autopsy. This may be due to the fact that the patient's blood was replaced from time to time with new blood and saline.
6. Autopsy findings were characteristic of cortical necrosis except that in our case an ascending infection changed the kidney picture slightly.
7. It appears that the kidney injury was most likely due to toxic products formed from the dead fetus.



8. The disease is similar in many respects to, but is entirely different from, eclampsia.

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500 FIDELITY BUILDING.

### THE EVALUATION OF METHODS IN OBSTETRIC ANALGESIA AND ANESTHESIA: WITH SPECIAL REFERENCE TO GAS-OXYGEN\*

BY CARL HENRY DAVIS, M.D., F.A.C.S., MILWAUKEE, WIS.

THE desirability of pain relief in labor is no longer a matter of discussion. Severe pain is not essential to childbirth and it is the duty of the obstetrician to give the maximum relief which may be obtained without sacrificing the safety of mother or infant. Satisfactory relief is usually possible, but it requires a careful study of the individual case and frequently an adaptation of various methods to the needs of the woman during the different stages of labor. Measures for pain relief must be divided into those which are applicable in the first stage and those which may be used during the second stage. Standardization is desirable but impracticable except in so far as a general plan may be followed. Here, as in other surgery, teamwork is essential to success.

#### FIRST STAGE ANALGESIA

Labor always varies to some extent, and no two women will react in exactly the same manner. Normally there should be little or no pain until near the end of the first stage and, therefore, no occasion for the use of any anesthetic agent. The women in this group may require hypodermic medication for sleep in the effort to prevent fatigue and nervous wear and tear. A considerable percentage of women, however, suffer more or less during the period of cervical effacement and dilatation and relief is needed. This may be accomplished in most cases by hypodermic medication. The dosage must vary with the type and frequency of the contractions and the degree of dilatation. Heroin gr.  $\frac{1}{12}$  or pantopon gr.  $\frac{1}{3}$  and hyoscin gr.  $\frac{1}{100}$  is prepared in the syringe. If early in labor with pain moderate and contractions short only half of the dose is injected, the rest being given when needed. A severe labor requires the full dose and must occasion-

\*Read before the Sixth Annual Congress of Anesthetists, Washington, D. C., May 17, 1927.

ally be supplemented by an inhalation anesthetic or the colonic instillation of ether-oil. Long labors with an abnormal position of the head or a long rigid cervix frequently require additional hypodermics. In such cases a reduced dosage is administered. I usually order heroin gr.  $\frac{1}{24}$  and hyosin gr.  $\frac{1}{300}$ , later repeating if necessary. Recognizing that the combination of an opiate with hyosein may interfere with respiratory efforts of the child at birth, one should try to avoid hypodermic medication during the last two hours of labor. I am in complete accord with Williams who states that, in his experience, heroin is vastly superior to morphine in its analgesic effect, and it possesses the additional advantage in that it does not decrease the intensity of the uterine contractions and has no deleterious effects on the child. Unlike morphine, heroin is not a respiratory depressant. When our present supply of heroin is gone pantopon will be used, but I believe it a rather poor substitute.

Inhalation anesthetics may be administered intermittently for long periods of time. I have on several occasions used intermittent nitrous-oxide-oxygen analgesia for as long as fifteen hours. Protheroe Smith used chloroform analgesia for as long as twenty-eight and one-half hours, and in at least one case Simpson gave it more than thirteen hours. Both chloroform and ether slow up labor more than nitrous oxide or ethylene. In a paper presented ten years ago I brought forward experimental evidence that even small amounts of chloroform administered with oxygen may cause marked fatty degeneration in the livers of the newborn. It would seem that chloroform could be discarded in present day hospital practice, and that in most instances ether could replace it in the home delivery. Ether, unless contraindicated, is the inhalation anesthetic of choice if the labor is tetanic, as it lengthens the interval and shortens the duration of the contraction. The chief advantage of the colonic ether-oil over inhaled ether is that the action is continuous over a considerable period of time. Its physiologic action is unchanged. It has been demonstrated at the New York Lying-In Hospital that when the quinine is left out of the Gwathmey combination there is definite second stage and perineal delay (Harrar). Harrar's report on 5800 cases shows that quinine in sufficient dosage will overcome the tendency of ether to slow up or stop labor, and if it may be accepted that there is no definite risk from the quinine, the Gwathmey ether-quinine-oil combination may prove a valuable adjunct to hypodermic medication in long hard labors. When quinine has been used to induce labor, however, there may be a definite risk to the baby if more is added to the ether-oil. Ether-oil is contraindicated in patients with kidney trouble and when there is a history suggestive of an irritable colon or colitis.

The dose of morphine used in the so-called synergistic analgesia is as great as was used in "twilight sleep." Pharmacologists question

the value of adding the magnesium sulphate, and the carefully controlled animal experiments of Beckman indicate that it is better to omit it.

#### SECOND STAGE ANALGESIA AND ANESTHESIA

The pain of the second stage is usually controlled in part by the anesthetic agents which have been administered during the first stage. With the heroin-hyosein combination many patients do not require an inhalation anesthetic except for a few minutes during the perineal stage. My patients are taken to the delivery room late in the first stage or early in the second stage of labor. This makes it possible to start inhalation analgesia when needed and conditions are favorable for a quick delivery should this become necessary. For second stage intermittent analgesia nitrous oxide or ethylene with oxygen has proved of the greatest value. Ethylene is the more powerful and while it is more inclined to slow up labor it has been used almost exclusively in the delivery room at Columbia Hospital during the past two years.

The technic of administering gas-oxygen analgesia to an obstetric patient is simple, being based on the principle of "beating the pain to it." A sufficient quantity of the gas must be inhaled at the beginning of the contraction to produce analgesia or the patient will experience pain and carry the memory of it even though she may be completely anesthetized during the latter part of the contraction. Success or failure in the administration of an intermittent obstetric analgesia hinges on an appreciation of this fact. Many expert surgical anesthetists are complete failures in the delivery room because they are not interested in the obstetric problem and do not cooperate. The patient should get the anesthetic agent with the first inspiration after a contraction starts and it should be continued for a sufficient number of inhalations to relieve the pain of that contraction. The number varies with the susceptibility of the patient, and the type and duration of the contraction, as well as the anesthetic employed.

The anesthetic is administered continuously during the delivery of the head, and the patient should be unconscious at this time. Her expulsive efforts are replaced by the Kristellar maneuver, i.e., pressure on the fundus. As soon as the head is delivered the gas-oxygen mixture is replaced by pure oxygen, which is continued until the cord is tied.

Perineal repair may be accomplished satisfactorily with any of the inhalation anesthetics. There is no serious objection to the use of ether at this time if pituitrin is used to contract the uterus, although it is generally recognized that ether relaxes the uterus and thereby increases the loss of blood. There is comparatively little bleeding as a rule when nitrous oxide is used. It is believed that there is a slight increase with ethylene but less than with ether. Conservation of blood during a delivery undoubtedly lessens the chances of sepsis and favors

a smooth convalescence. When gas oxygen has been used for the delivery it seems better to continue with it for the repair as the administration of ether would save very little in cost and it might cause considerable nausea.

#### OPERATIVE OBSTETRICS

Nitrous oxide and oxygen may be administered for all operative deliveries with the exception of version. During a version complete relaxation is essential to safety and ethylene-oxygen or ether is required. For this operation ethylene-oxygen seems to have all the advantages claimed for chloroform without its dangers. A nitrous oxide-ether-oxygen combination may be used.

Most forceps deliveries may be accomplished with more or less intermittent gas-oxygen analgesia. The patient may be anesthetized while the blades are applied and thereafter be kept under analgesia so that she can bear down when traction is made on the forceps. Safety in the use of forceps is dependent largely on the use of the instrument to guide the head rather than to pull it. I rarely use more than a few pounds traction, and try to accomplish the delivery through Kristellar pressure and the patient's expulsive efforts. Gas is more adaptable to this technic than ether because of the rapidity with which the depth of analgesia and anesthesia may be varied.

Nitrous oxide-oxygen is not satisfactory as a rule for cesarean section unless combined with local anesthesia or ether. When ethylene oxygen is used it is rarely necessary to add any ether. Cesarean section may be performed satisfactorily with local anesthesia.

#### SACRAL AND SPINAL ANESTHESIA

Pregnancy and labor are at times made unusually dangerous because of certain problems which arise from pulmonary, renal or cardiac complications, alone or combined with a severe toxemia of pregnancy. There are patients who cannot take any of the inhalation anesthetics. While a great deal of relief may be given by the use of hypodermic medication such as heroin and hyoscin, additional relief is needed at the time of delivery. The perineal injection of local anesthetics is not sufficient and we must turn to spinal or sacral anesthesia. The results thus far reported from spinal anesthesia show that it is far more dangerous than the sacral or caudal and no more satisfactory for obstetric use. Bonar and Meeker in 1923 reported very satisfactory results with various types of sacral nerve block. Their results have been confirmed by Lundy and others.

#### NITROUS OXIDE VERSUS ETHYLENE

Evaluation of anesthetic agents is only possible from a comparison of experimental and clinical observations. In 1917, I reported a comparative study of various inhalation anesthetics. The animal experi-

ments were repeated in 1924 with ethylene-oxygen. The same anesthetic chamber was used and other conditions were similar. Eleven pregnant guinea pigs and three rabbits were anesthetised for periods varying from one to five hours. It was found that an even anesthesia is more easily obtained with ethylene-oxygen than with nitrous oxide-oxygen. In this experiment none of the animals went bad during an anesthetic. When groups of guinea pigs or rabbits are deeply anesthetised with nitrous oxide-oxygen it is frequently necessary to take out one for resuscitation and an occasional animal will die suddenly. It is apparently possible to asphyxiate the young in utero without killing the mother with ethylene-oxygen just as it is with nitrous oxide-oxygen. All anesthetics undoubtedly reduce the oxygen carrying power of the blood to some degree and this must be kept in mind when there is evidence of fetal asphyxiation from a prolonged or tetanic labor. Here the advantage appears to be with ethylene since anesthesia may be obtained with a mixture containing a higher percentage of oxygen. Tissue changes following protracted ethylene-oxygen anesthesia are suggestive of slight cell edema. No evidence of fatty changes or cell destruction could be found.

My experience with nitrous oxide-oxygen in obstetrics dates back to 1909, and ethylene has only been used since 1923. Following an explosion in 1924, the use of ethylene was not permitted in Columbia Hospital until the Spring of 1925. During the past two years it has gradually replaced other anesthetics in the delivery room and to a considerable degree in the operating rooms. Since May, 1925, it has been used for 580 deliveries. The average time of administration was sixty-three minutes. The average cost to the patient was about \$12.00, with a minimum of \$8.00 and a maximum of \$25.00. The anesthetist's report for the year 1926 showed a total of 1526 anesthetics administered to 352 obstetric patients, 483 major surgical cases, and 691 minor surgical cases. The anesthetics used are shown in the following table:

Ethylene-oxygen anesthetics .....	921
Ethylene-oxygen-ether anesthetics .....	139
Nitrous oxide-oxygen anesthetics .....	96
Nitrous oxide-oxygen-ether anesthetics .....	23
Ether anesthetics .....	347
Total .....	1526

From this data it is very evident that the physicians and anesthetists at Columbia Hospital believe in the superiority of ethylene-oxygen as an anesthetic. It should be said that it does not give uniformly satisfactory results. An occasional patient will do better with nitrous oxide-oxygen and at times one may wish to shift from one anesthetic to the other during a delivery or an operation.



## NURSE ANESTHETISTS

It is obviously a financial impossibility to furnish a physician anesthetist for every delivery and every operation. It is highly desirable that internes give some anesthetics as a part of their training but with the present scarcity in most parts of the country they have little time for anesthetics. We have found that nurses make excellent anesthetists. In many ways they are better fitted to give anesthetics than most medical graduates and I believe that in the future most obstetric and a constantly increasing number of surgical anesthetics will be administered by specially trained nurses.

## SUMMARY AND CONCLUSIONS

The woman in labor is entitled to the maximum relief of pain which is possible without sacrificing safety. With methods now in use there is no longer any excuse for the old time sound-proof crying room, and the delivery room is no longer a chamber of horrors. Formerly the outcries of obstetric patients made the nights hideous for everyone in a hospital, but today most women may be carried through labor with few moans and no outcries. Attention to pain relief does not require more nursing or medical attention than is necessary for the safe conduct of labor.

The obstetrician must be familiar with all methods of pain relief and adapt them to the needs of the patient during the different stages of labor. Standardization is impractical except in so far as a general plan may be followed. I have experimented with most methods of pain relief and as a result of animal experiments and clinical experience have adopted the following plan for my private patients:

First stage pain is relieved by hypodermic medication, occasionally supplemented by colonic ether-oil. Heroin gr.  $\frac{1}{12}$  or pantopon gr.  $\frac{1}{3}$  and hyosein gr.  $\frac{1}{100}$  is prepared in the syringe. The patient is told that she may have a hypodermic at any time she may wish it because of painful contractions. When she begins to complain a rectal examination is made to determine the degree of dilatation. If early in labor with little dilatation, pains moderate and contractions short, only one-half of the dose is injected, the rest being given when needed. A severe labor requires the full dose at one time. Colonic ether-oil is limited to the patients who have a tetanic type of contraction or an unusually painful first stage with slow dilatation of the cervix. Ether-oil is contraindicated if the patient has kidney disease or a history of an irritable colon or colitis. In long labors additional hypodermic medication is frequently needed, and reduced doses such as heroin gr.  $\frac{1}{24}$  or pantopon gr.  $\frac{1}{6}$  and hyosein gr.  $\frac{1}{300}$  may be administered. An attempt is made to avoid hypodermic medication during the last two hours of labor. Hypodermic medication may also be used during the night to give sleep to patients who may not have much pain but who are being

kept awake by the constantly recurring uterine contractions. This tends to conserve strength and lessens the tendency to exhaustion late in labor.

Near the end of the first stage or early in the second stage of labor the patient is taken to the delivery room and intermittent gas-oxygen analgesia used as needed to control the pain. Many patients require gas only for a few minutes during the perineal stage. Either nitrous oxide-oxygen or ethylene-oxygen may be used. For the second stage analgesia ethylene appears to have some advantages over nitrous oxide. It is the more powerful anesthetic and may be administered with a higher percentage of oxygen. Both gases undoubtedly reduce the oxygen carrying power of the blood. During the past two years 580 patients at Columbia Hospital have had ethylene-oxygen for delivery. The average time of administration was sixty-three minutes and the average cost to the patient \$12.00. The anesthetics were administered by nurse anesthetists.

Gas-oxygen is satisfactory for most operative deliveries except those requiring a considerable degree of relaxation such as version. For these ether may be added to the mixture but it is rarely needed when ethylene-oxygen is employed. Cesarean section may be performed with local anesthesia, combined anesthesia or with ethylene-oxygen. Caudal anesthesia or sacral nerve block is advised for patients with severe pulmonary cardiac and renal complications, with or without toxemia.

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141 EAST WISCONSIN AVENUE.

## DYSTOCIA DUE TO FECAL IMPACTION RESEMBLING A PELVIC TUMOR

By W. W. RAMBO, M.D., ST. LOUIS, MO.

(From the Department of Obstetrics, Washington University School of Medicine and Barnes Hospital)

**D**YSTOCIA due to pronounced fecal impaction would seem to be of rare occurrence, for a search of the literature reveals but few cases. One case was reported by Rossner<sup>1</sup> in 1886. This patient had a rectovaginal fistula and during later pregnancy there was an impacted mass of feces as large as a child's head in the rectum. After manual removal, the patient, a multipara, was delivered spontaneously.

Another case was reported by L. Meyer<sup>2</sup> in 1899, in which an obstruction from fecal impaction was suspected. Later, symptoms resembling ileus developed. Subsequently the patient died and an autopsy revealed an obstruction due to a congenital deformity of the mesentery.

The following case seems worthy of report because the fecal mass resembled a tumor blocking the entrance to the pelvis and deflecting the fetal head, and because accurate record was kept of the mass removed, which was approximately the weight of a seven months' fetus.

M. E. J., aged 16 years, colored, came to the prenatal clinic of Washington University on July 9, 1926, with a history of having menstruated last on Feb. 19, 1926. The patient stated that she had been well, her bowels were regular, and it was necessary only occasionally for her to take small doses of Epsom salts. The date of her next visit was November 15, eleven days before the expected date of confinement. At this time a rectal examination demonstrated that the rectum was packed with fecal material. Vaginal examination showed the pelvis completely blocked. The cervix could not be felt. The head of the child was deflected into the left iliac fossa. Examination of the blood taken upon the first visit revealed a positive Wassermann reaction.

The patient was sent into Barnes Hospital where 265 gm. of putty-like fecal material were removed manually from the rectum. Thereupon, the patient was given an enema of mineral oil and hydrogen peroxide and an additional 975 gm. of fecal material were expelled. A second vaginal examination revealed a dilating cervix and a considerable amount of feces remaining. The enema was repeated and at this time 540 gm. of feces were expelled. The total amount expelled was now 1780 gm. (approximately three pounds and fifteen ounces). There was at this time three fingers' dilatation and the contractions were regular and of good quality. The patient was given morphine-hyoscine, the head entered the pelvis, and four hours later delivery was completed with a perineal forceps after a right mediolateral episiotomy. The child weighed 3010 gm. The postpartum course was uneventful. The bowels were kept regulated by daily administration of mineral oil and enemata of soapsuds.

On the twelfth day postpartum the patient was given a special barium enema and examination showed a general colonic hypotonicity of moderate degree, without any distention. There were atypical irregularities of the contour at the recto-sigmoid junction and at the iliocecal valve; these, however, were not characteristic of any organic lesions.

From a practical standpoint, it is well to bear in mind the possibility of such extensive impaction of the bowels and its differentiation from pelvic tumors.

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## Department of Maternal Welfare

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CONDUCTED BY FRED L. ADAIR, M.D.

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### Recent Literature

SIR EWEN MACLEAN considers "puerperal mortality" in an article published in the *British Medical Journal* of March 13, 1926. Dr. Maclean is Chairman of the Puerperal Morbidity and Mortality Committee of the British Medical Association. He presented some remarks on the interim report of this Committee before the Monmouthshire Division of the Association. He believes that a zealous application of the knowledge we already possess by those who practice midwifery would result in striking improvement. It is in his opinion also true that until we acquire further knowledge there will remain a mortality rate sufficiently large to cause concern. "It was this consideration, I think, which led the Puerperal Morbidity and Mortality Committee of the Association to submit to the Council a recommendation urging that provision should be made for investigation into the factors which constitute, and the conditions which vary, resistance to disease, particularly as regards pregnancy and the puerperium." Recognizing that a community can, within limits, determine its own death rate it is necessary to expend considerable sums of money to secure the necessary institutions, equipment, and personnel to secure a lasting improvement in maternal morbidity and mortality. It is difficult and expensive to secure and maintain genuine and sustained interest of the public in these health matters. It took many years to convince the profession and public of the necessity for the Midwives Act.

The voluntary support of institutions, such as hospitals, blinded Governments to the necessity of providing money for institutions for research and for the care of the sick. A beginning has been made in the establishment of the Medical Research Council. Antenatal care is becoming recognized as reducing some of the ills and accidents of childbirth, but it is necessary to have proper provision for natal care in homes and institutions in order properly to "carry through." The absence of this principle is the greatest handicap to the proper notification of puerperal fever, which is essential to the success of our attack upon the largest single factor in puerperal morbidity. It is difficult to decide whether notification shall apply to (a) cases in which diagnosis of puerperal infection may be presumed to have been established, or (b) all cases of sustained puerperal pyrexia. The British Medical Association has taken the matter in hand as one of profound importance. It is gratifying to observe by many signs that the interim report of the above committee has aroused the deep interest of our Divisions and Branches.

"The Divisional replies to the questionnaire will be analyzed by the Committee, and before a further report, with recommendations, is submitted to the Council, the Committee hopes to have the great advantage of conferring with representatives of the Ministry of Health, the Medical Research Council, the Obstetrical and Gynecological Section of the Royal Society of Medicine, the Society of Medical Officers of Health and the Central Midwives Board, to which bodies the Council will issue invitations. The report and recommendations will in due course come before the Representative Body after consideration by the Divisions."

**D**R. LOUISE MC ILROY, in a paper read in opening a discussion on the interim report of the British Medical Association Committee on "Causation of Puerperal Morbidity and Mortality," presents some interesting material. This paper was published in the *British Medical Journal* of March 13, 1926. She states that in 1923 there were 758,131 living births with 2,892 maternal deaths, or 3.81 per 1000. Puerperal sepsis caused about one-third of these and eclampsia one-ninth. Deaths from other causes amounted to 1,552 or about 2 per 1000. She believes that the reduction of the infant mortality rate from 154 in 1900 to 77 in 1922 was due in no small measure to improved obstetric practice. She is of the opinion that there was definite evidence of wastage of infant lives, but that no such evidence exists regarding preventable wastage in maternal lives. Mortality statistics do not tell us of the suffering and disability which result from maternal morbidity. She recognizes that maternal morbidity and mortality are largely influenced by bad housing and economic or industrial conditions. In this presentation she limits herself to medical points of importance.

*First:* Extension of ante- and postnatal work is the most effective means of improvement. Antenatal and postnatal clinics should not be confused with those for child welfare clinics; the staff for these clinics should be composed of practitioners experienced in obstetrics.

*Second:* There is room for much improvement in education. There must be facilities for postgraduate training of young practitioners, and courses in which the older ones may refresh their knowledge. We do not want more lectures, but facilities for clinical work and the actual handling of patients under the supervision of competent teachers. It is necessary also to provide for the education and training of midwives who do 60 per cent of the deliveries of the country.

*Third:* The provision of more beds for abnormal cases and for women who desire institutional accommodation, owing to housing difficulties. The material thus provided could be utilized for educational purposes.

*Fourth:* Sepsis, though a notifiable disease, has no workable definition. We know it may be contagious and exogenous and may be largely avoided by cleanliness. We are satisfied that it is also endogenous, but we do not know how it arises. Facilities for research are necessary, especially directed toward immunity and the defensive nature of the bacteria of the genital tract.

*Fifth:* The existing organization of midwifery is chaotic. Panels of medical practitioners specially experienced in midwifery should be set up, and midwives call those members on these panels. The antenatal and other clinics should be coordinated. Cases of death in childbirth should be investigated. Cases of sepsis should be treated in open-air isolation wards of maternity hospitals.



# Society Transactions

## AMERICAN GYNECOLOGICAL SOCIETY

### FIFTY-SECOND ANNUAL MEETING

HOT SPRINGS, VA., MAY 23, 24 AND 25, 1927

*(Continued from the November issue.)*

DR. G. BROWN MILLER, Washington, D. C., read a paper on **Surgery Versus Radiotherapy in the Treatment of Uterine Tumors.** (For original article see October issue, page 530.)

#### DISCUSSION

DR. FLOYD E. KEENE, PHILADELPHIA, PA.—I cannot emphasize too strongly Dr. Miller's remarks regarding the contraindications to irradiation in the treatment of benign uterine hemorrhage or the importance of accurate diagnosis, for upon these two factors success must depend.

I am convinced, however, that if the limitations are recognized and the contraindications observed, there are certain types of lesion in which irradiation is the method of choice and is preferable to operation. In addition to those he has mentioned I would add the adolescent menorrhagias which often can be controlled in no other way except by hysterectomy.

I would take exception to Dr. Miller's selection of the title of his paper, since the word "versus" implies competition and in my opinion, such is not the case. I believe that in the treatment of benign uterine hemorrhage there are two methods available: the one, operation, the other, irradiation. The indications for the one are just as definite as those for the other, that in no way should the one be considered a competitor of the other.

I quite agree with Dr. Miller in his statement that the majority of symptomatic myomas should be subjected to operation as is evidenced by the fact that during the past three years operation has been the chosen procedure in about 70 per cent of our cases.

On the other hand, in the 25 to 30 per cent of irradiated cases the results have been eminently satisfactory because of their careful selection, with the very minimum of morbidity and none of the dire disasters which Dr. Miller mentions as possible irradiation sequelae.

Nor do I believe that radiotherapy is still in the experimental stage as a method of treating benign hemorrhage. Many years of experience and an intensive follow-up study in the leading clinics of the world have removed this form of treatment from the realm of the experimental and warrant the statement that while the mode of action may still be somewhat obscure, the results of its action are no longer open to question.

In the treatment of cancer of the uterus, particularly cancer of the cervix, the question is still a debatable one, and the excellent results which Dr. Miller reports should make us slow in giving up operation in favor of irradiation.

I agree with him in advising operation in cases of corporeal carcinoma; in cervical cancer, however, operation has not been performed in our clinic during the past five years.

Our results so far as cure are concerned, while not so good as those reported from several other clinics, are equal to those obtained by operation as performed in Dr. Clark's clinic, so at present, I believe that in the early case the combination of cautery amputation and radium is the procedure of choice.

DR. C. JEFF MILLER, NEW ORLEANS, LA.—Since 1914 I have treated over five hundred cases of fibroid of the uterus and uterine hemorrhage with radium, and my experience makes me agree heartily with the statement Dr. Keene has made, that this type of therapy has long since passed beyond the experimental stage. Naturally, during the early years, we were obliged to proceed tentatively and we made many mistakes, but now that the indications, and, more important, the contraindications have been definitely established, irradiation is one of the most valuable methods of treatment which the gynecologist possesses.

In my private practice, with a careful selection of cases, I have treated probably 25 per cent of the fibroids I have seen during the last five years in this way. On the other hand, at Charity Hospital, where a large colored service presents entirely different problems, surgery has been indicated, usually of a radical kind, in probably 98 per cent of all such cases. These colored women present growths of enormous size and of all types, and the percentage of adnexal complications runs well over 90 per cent, so that radium may be employed only in the exceptional case.

I take issue with Dr. Miller in his views on irradiation in cancer of the cervix. For one thing, surgery in the borderline case should no longer be considered. Large series of cases prove that the borderline case is most often the advanced case, and radium gives results infinitely better than surgery. Control series of cases prove, quite aside from the high primary mortality which follows operation under such circumstances, that more five year cures are achieved by radium than by surgery. Surgery still has a place in the treatment of cancer of the cervix, but it is only in the extremely early case, when the diagnosis must be made by microscope. Speaking categorically, when the diagnosis can be made on clinical signs, the case is advanced and surgery is not indicated. For my own part, I have done only two radical operations for cancer of the cervix in the last eighteen months, and in both instances I could not make a definite diagnosis on the clinical evidence alone. In my opinion only two types of cervical carcinoma need be considered by the gynecologist; the early case, in which surgery is possible, and the advanced case, in which it is not. A further division into borderline cases simply introduces confusion, for it is a classification which depends entirely on the personal equation of the surgeon, and is therefore useless for practical purposes.

DR. FRANK W. LYNCH, SAN FRANCISCO, CAL.—During the last ten years, we have treated approximately 350 cervical cancers and have followed nearly all of them in our study. We have accepted five years as the minimum time for a cure since we find in our series twice as many three year cures as five year cures.

I have been very much perplexed in our radium studies because we have not cured as many early cervical cancers by radium as I feel we should if radium really does all that surgery can do. I find that I have cured fewer early cases by radium (only 30 per cent) than we have a right to expect because we have really cured several perfectly inoperable cases (9 per cent), and it seems reasonable to believe that radium should cure all early and local cancers if it cures any that are late and widespread. Study of the literature supports this view since there were a year ago only 308 reported cases of early cervical cancers that were treated with radium alone, only 40 per cent of which were five year cures. Heymann, whose results have caused the Swedes to restrict radical surgery for cervical cancers, obtained 16 per cent of five year cures by radium in late and borderline cases, and only 40.5 per cent in his early cases. This we believe indicates that the problem of radium has not yet been fathomed.

Contrasting the results of radium and surgery we find in the literature 2100 cases of cervical cancers that were operated radically, with 42 per cent of five year cures. Most of the surgical series were completed several years ago, when surgery alone afforded cure, and therefore included a very large proportion of borderline cases which furnished most of the surgical mortality and few five year cures. I am convinced from my own experience with radium surgery in the treatment of cervical cancers that, at the present time, there is a place for truly radical surgery in and only in the treatment of early growths. Practically, however, I find that I am operating upon only a very few selected cases and that I am treating with radium all that are not good operative risks, even though they have early cervical cancers. Thus far we have done 48 radical cases with five deaths, or approximately 10 per cent of operative mortality. Our first series of 17 early cervical cancers treated by radical surgery, some but not all of whom had radium preoperatively or postoperatively, has given 60 per cent of five year cures.

In cancers of the fundus there is also a difference of opinion. Contrary to the reports of others, I find that I am curing by the simple panhysterectomy comparatively few cases of cancer of the body of the uterus, for the reason I think, that formerly I have not selected my cases but have attempted to operate upon nearly all. Cancer of the body of the uterus, generally speaking, comes in older women who do not stand well the shock of a hysterectomy, so my operative mortality is far too high. Moreover, I have been distressed to find that many of the survivors presented late recurrences. By selecting carefully the patients that I operate upon and by radiating all others I believe I will have far better results than when I operated upon all, provided that I operate radically, since I have come to believe with Peterson that we shall cure cancer of the fundus only by the truly radical operations and not by the simple hysterectomy.

I feel, therefore, that any type of uterine cancer, cervical or fundal, is better treated by radium than by a simple hysterectomy, but that at present there is a definite although greatly restricted field for truly radical surgery in both cervical and fundal cases if they are early tumors and seem likely to withstand operation. I irradiate all cervical cases prior to operation.

DR. MILLER (closing).—I had expected to be criticized but these are my honest views. I must say that my experience with radium and x-ray has been largely that of an observer. I do not use it myself but I have carefully watched those who do use it. I have referred a number of cases to them and have reached these conclusions by my own experience with surgery and comparing that with the results of the men who employ radiotherapy in the treatment of fibroid tumors and cancer of the uterus.

DR. JOSEPH B. DELEE, Chicago, Ill., presented a paper entitled **Two New Ideas on the Mechanism of Cervical Injury During Labor.**  
(For original article see October issue, page 499.)

#### DISCUSSION

DR. COLLIN FOULKROD, PHILADELPHIA, PA.—Some years ago I made a study of the lacerations of the cervix and found that among a number of patients in the hands of all operators in one clinic there was something like 5 per cent of noted cervical lacerations. I find now in my own private practice there are less than 2 per cent which need repair; as the years go on the lacerations are slowly growing less. We are using more sedatives, waiting longer for the normal dilatation, and securing better results with regard to the different forms of lacerations. The forms enumerated by Dr. DeLee may be added to by suggesting that one of the causes of laceration is the rigidity of the tissues, which he has suggested in his form of possible development lacerations. It has been impressed upon me that the

time is rapidly coming that when a woman cannot dilate the cervix more than one finger in more than twenty-four hours we shall consider a cesarean section rather than allow her to push down the cervix in front of the child's head causing a prolapse of the uterus, as well as an eversion of the canal.

DR. H. C. BURGESS, MONTREAL, CANADA.—Whenever I see a large fibrous polyp expelled through a resistant cervix without any damage, I am convinced that the kind of dilator and the element of time are the important factors in any laceration of that appendage. In my experience this element of time can best be controlled, with the greatest margin of safety as far as the mother and child are concerned, by repeated doses of heroin given at frequent intervals. Hemorrhage is the only indication that prompts me to interfere with the cervix immediately after the delivery is over. The one exception to this rule is perhaps when I have been called upon to do a version and extraction. If hemostasis becomes necessary simplicity of operation is essential, and I depend on a deep suture, paying particular attention to the upper angle of the wound and making every effort to include the musculature of the cervix.

DR. WILLIAM C. DANFORTH, EVANSTON, ILL.—Stimulated somewhat by the paper that Dr. Farrar read here last year in which she brought out the possible relationship between cervical injury and the production of cancer, and by the discussion which followed, which seemed to show that the interest of our members was centered upon the curing of pathology rather than upon its prevention, I looked up the private cases taken care of by my associate and myself during the past three years, excluding all others because we had very accurate records of these. The total was 975; eliminating all cesarean sections, in which, of course, cervical injury cannot occur; eliminating all cases in which bags were used, which were few; and eliminating any cases in which any degree of manual dilatation was done, left us 920 cases. In these we found recognizable tears which were sufficient to demand surgical attention in 104, a little more than 10 per cent. We regarded anything as requiring surgical attention if the tear was as much as 2 cm. They varied from 1 to 5 cm.

In studying these cases we noticed also this same V-shaped characteristic which Dr. DeLee has mentioned. Dr. DeLee did not emphasize as much as I had hoped he would the necessity of putting in sutures in a definite way. If the sutures do not take in the entire musculature of the cervix, together with the muscle that is retracted at the time, they almost always fail to be effective, and I believe that is the reason why so many men have felt that the repair of the cervix was of little value. Also, the sutures must not be tied tightly because the cervix is soft. They must be brought together very loosely and inserted about 1 cm. apart.

I believe too, as stated by the last speaker, that the use of an opiate during the first stage of labor not only keeps the patient quiet but has a definite relaxing effect upon the cervix and helps avoid some tears. I do not think that suture of the cervix is a procedure which we can recommend for use indiscriminately. It is definitely a surgical procedure, an operating room procedure. With those conditions present I believe it is a very valuable addition to our technic and well worth trying. It is often said that it is unnecessary to pay any attention to these lacerations, that they will heal spontaneously anyway. If that is so, why do we see so many deeply gashed cervixes in our daily gynecological work?

DR. DELEE (closing).—The cervix is thin at the sides. The borderline between the two muscular anterior and posterior lips is filled with connective-tissue fibers and some muscle fibers. Right alongside the cervix, when the woman is pregnant six to eight weeks, it is easy to feel the soft character of the tissue like a groove and I have used that often as a means of early diagnosis of pregnancy.

Has any one ever found a woman with cancer of the cervix who has had cesarean section, unless she had had several babies through the natural passage? We know cancer occurs in multiparae.

Dr. Danforth reports only 10 per cent lacerations of the cervixes. I have had many more than that. Pituitrin is one of the greatest causes of laceration of the cervix. We almost never use pituitrin in the first stage of labor. Occasionally at the beginning of labor we use  $\frac{1}{2}$  to 1 minim, but after the pains have started pituitrin is discontinued.

The differentiation between contused and torn tissues, after labor has been a difficult thing to make. We try to do that by differential staining. By painting the cut surface with mereurochrome, the vaginal portions of the cervix can be very easily distinguished.

DR. GEORGE W. KOSMAK, New York City, presented a paper entitled **Fundamental Training for Obstetric Nurses.** (For original article see *Surgery, Gynecology and Obstetrics*, November, 1927.)

#### DISCUSSION

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MARYLAND.—Every one admits that something is radically wrong with the nursing situation, and I think that as doctors and as members of hospital staffs with training schools for nurses a great part of the responsibility is ours, because in the early days when such schools were developing we allowed their control to drift entirely into the hands of the nurses and of the hospital superintendents, neither of whom were usually fitted to cope with educational problems. The result is that in most institutions the training schools are run primarily for the benefit of the nurses, and especially for the advancement of the status of women in general, and with relatively little regard to the welfare of the patients or to the medical needs of the hospital. Indeed, I think it safe to say that in the majority of the best hospitals advice concerning the conduct of training schools is rarely asked of the more experienced members of the medical staff, and that when it is volunteered, it is regarded as impertinent interference.

Moreover, the strictly medical teaching is done in great part by young men, who stand rather in awe of the nursing authorities, with the result that the type and scope of the instruction is dictated by the latter, and often resembles a compressed curriculum of a medical school, instead of the practical instruction which is desirable. In other cases, the young teachers, carried away by their enthusiasm, waste hours in teaching about rare diseases which have no practical significance.

We cannot escape our share of the responsibility, for we have allowed such conditions to go unchallenged for thirty years, and have not faced the problem until it has become acute. At the same time, it is only fair to admit that in the past the pupil nurses were exploited by many hospitals, and were utilized with more regard to economic exigencies than to sound education.

Following the war a very radical change has come about, namely, that the scope for the remunerative employment of educated young women has become greatly extended. As a result relatively smaller numbers are applying for admission to the training schools, so that in all but a few of the best ones the applications for admission do not keep pace with the demand, and two things have happened. One is that in certain institutions those in charge of the schools have appealed to the medical staff for aid, and the other is that it has been attempted to face the problem in another way, and to bolster up and dignify the profession of nursing by giving it a university status. In this event, the three years of training are regarded as the equivalent of two years of college work, and are counted as part of the credit toward a collegiate degree. To my mind, the latter



may mean a great advance in education, but it will by no means solve the problem of providing intelligent nursing care either for the sick poor in the hospital ward or for the well-to-do in their own homes.

I must confess to being a heretic as regards college education in general; for, as conducted in this country, I regard it as an unmitigated failure and as a waste of time and money whether for men or women. I am glad to say that the Johns Hopkins University has come to the same conclusion, and has decided to do away with the Bachelor's degree and to limit its activity to the training of serious-minded students, who may eventually obtain the degree of Master of Arts or Doctor of Philosophy.

This decision has put a very effective quietus upon the proposition of giving a collegiate degree to our nurses, for, if we are abolishing it in the case of men, it would be absurd to revive it in the case of women—whether nurses or not.

A few years ago, when the situation was becoming difficult at the Johns Hopkins Hospital, a joint committee consisting of the superintendent of the training school and her chief assistant, the director of the hospital, and the heads of three of the main clinical departments, was appointed to consider the problem and to see what could be done to improve it. One of the first things was to make a careful survey of the curriculum in vogue, as well as those recommended by the various organizations interested in the training of nurses. It would lead too far to discuss the matter in detail, and here I shall only say that we made a radical cut in the number of lectures and in their stead substituted practical bedside instruction, which is often given by the heads of the various departments.

We realized where our fault lay, and we had the courage to face it frankly. In the obstetric training, we have eliminated a large number of lectures, and in their place my senior associates and I give a series of practical demonstrations in the delivery room, at the bedside, and in the nursery, which I feel confident will give the pupil nurses a totally different and more practical view of the subject. I believe that this is one of the ways of facing the problem, but it means that the senior members of the medical staff must take part in and control the practical instruction. The whole question is a big one, and the closer we look into it the more complicated we find it.

Do not think from what I have said that I am opposed to women of the highest education taking part in nursing. I am not, but I believe that such education should precede or follow the practical training of the nurse, and that only a few women will profit from it, such as those going into executive posts, teaching, or special work. On the other hand, I feel that the so-called academic education will not help in solving the problem of giving sound nursing care to the sick.

No one can deplore more than I the feeling that the profession of medicine and nursing are antagonistic. They are not, and should not, be so. Each is mutually dependent upon the other. We cannot take proper care of the sick without the nurse, nor can she without us, but from my point of view nothing can be gained by teaching the nurse to be a poor doctor, and to feel that she is demeaning herself by giving kindly and intelligent care to the sick.

DR. WILLIAM R. NICHOLSON, PHILADELPHIA, PA.—This subject is an extremely important one, and its presentation is very timely. If the subject were not so important, its discussion could be entirely of a humorous nature, based on the book which I hold in my hand. This book is a syllabus of obstetric lectures, to be given to nurses in training, and my experience with it began at the time of the late war, when my assistants were all in the Service, and I had to undertake the lectures for the nurses at the Presbyterian Hospital in Philadelphia, the Graduate School of Medicine of the University of Pennsylvania, and the Methodist-Episcopal Hospital of Philadelphia. At this time I was shown the book by one

of the directresses of nursing, and on looking it over, I found that there are thirty hours in the obstetric course, and that ten of them are to be given by a physician.

Now, those of us who have been teaching medical students know that we cannot put into a vessel more than that vessel will hold, and with this fact in mind, I would call your attention to a couple of the lectures as outlined in the book. These are chosen at random, any other of the ten lectures is open to the same criticism which I am making of these two.

The first lecture calls for a brief history of obstetrics; a consideration of the place of obstetrics in medicine, and the significant points in delivery. Remember that this is a lecture, supposedly to be given in one hour.

I would like, in addition, to call your attention to the fourth lecture. The general title is *Reproduction in General*, and in this hour the instructor is supposed to compare the cell differentiation in unisexual and bisexual animals, and also to consider the relation of sex to pregnancy, and the other aspects of sex.

All of us in this room are or have been actively engaged in the teaching of medical students, and I submit that even a fourth year medical student, trained as he is to absorb more or less indigestible mental pabulum, would be unable to get anything out of a lecture of this wide diversity in subjects, even if a teacher could be found who would be insane enough to attempt such in an hour's work.

These two instances will suffice to show the general lack of comprehension of the subject by whoever was responsible for this syllabus. Any of you who care to do so can look over the remaining lectures as given in this syllabus, and form your own opinion as to the value of such instruction. To my mind, it is a perfectly plain case of incompetency on the part of those who control the education of nurses at the present day. This type of instruction has absolutely no bearing upon the needs of the nurses. No living man or woman could possibly intelligently receive this tremendous mass of material in ten hours' instruction.

I give way to no man in my interest in the training of the nurse, but there must be at least a reasonable amount of intelligence exercised by those who assume the responsibility for their instruction.

DR. WILLIAM A. SCOTT, TORONTO, ONT.—Even in a country so primitive and wild as Canada the question of the education of nurses has become very acute; so acute in my particular section that at present I am acting on a committee which is trying to find out whether there is any possibility of a solution of the problems that have been brought up tonight. We find that it is much easier to be critical than it is to be constructive. The problem is out of our hands and that has happened in the way that Dr. Kosmak has spoken about tonight. We are not satisfied with the way the nurses are being trained. They are no longer nursing. In the first place, it is with great difficulty that we can get a nurse to take cases outside of a hospital. In the hospital, except in very dull times, nurses will not accept night duty. For a time they registered against obstetrics until they were forced to nurse obstetric cases for one year. At the present time in some of the institutions, at least, I am quite convinced that the majority of nurses no longer look upon a patient as a patient at all; she is simply a room number.

Recently I had a patient who entered the hospital at seven o'clock at night. She was operated upon at nine o'clock the next morning and during that time she had six different nurses looking after her and taking part in her preparation. As a matter of fact, one nurse started to give her an enema and a second one finished it. I do not imagine there was one of the six nurses who even knew the patient's name. We feel that that is not nursing, and the problem is just as acute from one end of Canada to the other as it is in the States. The situation in Canada has arisen partly from the situation over here. Our nurses have followed the syllabus that has been laid down in the United States, more especially in New York State, and apparently we cannot get away from it. As I see it the situation

is out of our hands; it is a legislative situation. We propose to do something about it, however. One of our proposals is that we shall start a register in the Academy of Medicine where we shall register every group of medical attendant, the trained nurse, practical nurse, male nurse, mother's helper, masseuse, and these will all be on call for medical men who can choose the particular type of attendant that they think is required in a particular case.

I believe Dr. Kosmak has proposed something that will be of value. If it is possible for a Society such as this to go on record in a very conservative but very positive way regarding their opinion of what constitutes the basic education for a nurse, a great deal will be accomplished.

DR. JOHN A. McGLINN, PHILADELPHIA, PA.—This has been a very interesting discussion and at times rather humorous, but I am thoroughly convinced that it will not get us anywhere because the question of nursing education is only a small part of the present tendency of education in general. The place where we should start reform in nursing education is in the primary school education up to the college education as it exists today. I do not know any child in the modern school or college who can speak German or Latin or Greek after he finishes college unless his governess has taught him this in his childhood. In other words, simply crowding facts into one's mind without proper understanding, means a failure in education. When we start to criticize the nurses we might as well criticize our own profession. Why should a man be doing all sorts of tests, witnessing elaborate operations in the surgical laboratory upon the skull and the spinal cord; in another department seeing all sorts of operations which he will never do, and in addition being compelled to do research work and present papers in his senior year, and giving him a lot of facts he will never digest, instead of making a doctor out of him? When we solve these problems we may possibly be able to accomplish something with the problem of nursing education. Modern education has gone on the rocks and we are not turning out educated men and women today. We are turning out a lot of halfwits from college; their brains are not being developed properly, they are not able to fit in the walks of life and many suicides are being committed because they do not know what it is all about.

DR. KOSMAK (closing).—I had hoped that somebody would say something in reply to what I have proposed, on the other side of the question. It is very pleasant indeed to find such unanimity of opinion on this subject. However, that will not accomplish anything and Dr. Litzenberg's proposal is exactly what I have proposed in my paper, that the Society take some definite action to define actually what we consider would be the proper training for an obstetric nurse.

Unfortunately doctors have proposed little or nothing in place of what we condemn and that, of course, is just what the nursing authorities desire. As long as we do not propose anything in place of what they have they say our arguments are not constructive but merely destructive criticism. I think we should appoint a Committee to write out a syllabus of obstetric lectures, and then adopt it officially as the best thought of the united membership of this Society.

DR. R. A. BARTHOLOMEW, Atlanta, Ga., (by invitation) presented a paper on **Prophylactic External Version—Review of the Literature and Analysis of 81 Attempted External Versions in 54 Consecutive Cases.** (For original article see November issue, page 648.)

#### DISCUSSION

DR. EDMUND B. PIPER, PHILADELPHIA, PA.—Morriceau, in 1683, stated that when the child was found in a position with the breech presenting it had been advocated by certain practitioners that this be changed into a head presentation,

but if they could definitely show him how this could be done he would be glad to do it.

I am speaking about something that I have never tried. I have not tried it for the reason that I would rather deliver a breech than I would a vertex in all patients except the primipara. That is a peculiarity, but in all of these injuries to the cord of which Dr. Bartholomew speaks the hemorrhages can be largely avoided if forceps are routinely put upon the aftercoming head and traction is not made upon the neck or upon the brachial plexus.

The spontaneous version which has been spoken of, I believe Dr. Bartholomew said he had never seen in the ninth month. Less than six weeks ago one of our cases was diagnosed as a breech presentation by x-ray and I verified the x-ray findings by manual examination. The next day the patient went into labor; she said the baby had turned around during the night. On examination again I found the head presenting; that was at the end of the ninth month.

I cannot quite conceive of the lack of danger in such a procedure. If one has ever done many podalic versions where one can feel all of the parts of the child, if there is a chance of the neck coming through the cord, as various blunders in many podalic versions will occur, there is just as much chance of those things occurring in the external version as in the internal. I am not inclined to think that if there is a breech presentation,—not with primipara but with multipara,—there is any reason for doing external version.

DR. HUGO EHRENFEST, ST. LOUIS, MO.—When I saw this paper announced I asked my associate, Dr. Liese, to collate from our private records all the data in regard to external version. Only a few hours ago I tabulated them without knowing anything about Dr. Bartholomew's figures; the identity of our results is striking. He had 54, and I, 53 cases of breech presentation encountered in pregnancy, of which he successfully turned 47 and I, 46, so that we both record 7 failures. Of these, in three cases the cause of failure was ascribed to abnormal shape of uterus (narrow uterus with oligohydramnios; fibroid, and one completely septate uterus finally requiring cesarean section). In three others, the attempt at version was made too late (one already in labor, the two others one and two days respectively before delivery), in the seventh case, the fetus had two large polycystic kidneys. Of these seven babies delivered in breech presentation, two were lost (the case of oligohydramnios and the baby with cystic kidneys).

The successful forty-six versions were done mostly within four to six weeks before labor, some within two weeks, one two days before delivery. All were done without anesthesia, in my belief, a most important point, because without anesthesia the procedure necessarily has to be done so gently that it is impossible to do the harm, unjustifiably feared by some writers. One of the cases of successful version had the shortest cord I have ever encountered, it required clamping and cutting within the vagina to permit escape of the fetus. This baby certainly would have been lost in a breech delivery.

Only five of the versions are noted as difficult on my records; 40 are specifically qualified as easy.

In regard to the technic I would stress just a few points: It is most important first to free the breech if already in contact with the pelvic inlet. This is best done by suspending the patient for fifteen to twenty minutes in the Trendelenburg position. When doing the version, the effort should be mainly directed toward pushing the breech upward; failures, in my opinion, are chiefly due to the seemingly more common attempt to push the head out of the fundus down towards the pelvis. If effort to turn in one direction (pushing breech up along vertebral column) fails, the attempt must be continued in the opposite direction (pushing breech towards fetal legs); this latter direction, in the sense of an increased flexion of the fetal spine proved to us three times as often advantageous as the other direction.

With only six exceptions (requiring repetition from one to three times) the very first version, without bandages, etc., maintained the fetus in cephalic presentation.

The babies were of average size, but three of them were over 4500 grams, and in all three the version was noted as easy. One baby weighing 4650 grams was easily turned in a iv gravida two days before delivery. In one case of successful external version a marginal placenta previa, discovered during labor, forced me to do again a podalic version.

Of the 46 successfully turned babies two were lost: one was born macerated, the mother luetic, with four plus Wassermann. The other died in labor, after fairly difficult forceps extraction in a primipara.

This mortality alone, in my belief, proves the justification for an attempt at external version in every case of breech presentation discovered within the last six weeks of pregnancy. I thoroughly agree with the essayist's statement that external version must be regarded a proper part of prenatal care.

DR. CARL HENRY DAVIS, MILWAUKEE, WIS.—Many breech presentations change to vertex late in pregnancy and had Dr. Bartholomew waited until nearer term the number of cases would be materially smaller. Attempts at external version may prove disastrous unless one manipulates very gently. One of my patients who moved to another city recently lost her baby from an external version performed under anesthesia. This led me to study my results in breech delivery, and I found that in the past seven years 32 babies had presented by the breech. Of these there was only one, an anencephalic, which was not delivered alive and free from injury.

I believe with Dr. Piper that the high fetal mortality in breech cases come from manhandling and failure to use forceps on the after-coming head when it does not come through easily. We used to teach external version in theory, but saved all of our breech cases for demonstration before groups of students. The high mortality from breech presentation in home deliveries suggests that all these cases should be sent to the hospital.

DR. JOSEPH B. DELEE, CHICAGO, ILL.—I believe that a middle course should be pursued. If version is possible with gentle means in the last 2 to 8 weeks of pregnancy, it should be attempted. If version becomes difficult on the ordinary operating table, without an anesthetic, it should be discontinued and the patient allowed to go to term. In some of the cases in which I failed with external version I found some interesting things by means of the x-ray. In two of the cases the baby's head was extended with a face presentation. In one case the baby had an extreme lateral flexion of the head, the ear resting on one shoulder.

When trying to do the version one should listen to the heartbeat every two or three minutes and if it shows signs of distress the attempt should be stopped. The placental site should also be decided upon before version is started and if the placenta is on the anterior wall in the line of version it is better to quit. The contour of the uterus and the simple expediency of pressing the stethoscope against the baby's back will help in determining this.

DR. BARTHOLOMEW (closing).—I agree with those who have emphasized the importance of gentleness and care in doing external version. That, of course, is very important, particularly if one uses an anesthetic and may thus be inclined to use too violent pressure and keep it up continually. But if one uses the care that he would if the patient were not under the anesthetic there is not much danger. The object of the anesthetic after all is simply to do away with the resistance which is occasionally such an obstacle to palpation.

The French and Germans have emphasized the life saving value of external version as a factor in reducing the death rate and saving more babies.



The figures, I think, speak for themselves. We have to accept a certain figure for mortality in breech presentations and this applies to general practice. We are trying to make obstetrics safer in general practice. The specialist may deliver breech presentations safely, but it is quite a different matter with the general practitioner. The true value of external version will not be realized until medical students are taught the need of prenatal care and how to diagnose presentations accurately, and if this knowledge is made use of in general practice, I feel sure it will be the means of saving many babies.

DR. RICHARD R. SMITH, Grand Rapids, Mich., presented a paper on **Toxic Goiter and Its Relation to the Gynecologic Patient.** (For original article see October issue, page 518.)

#### DISCUSSION

DR. W. E. CALDWELL, NEW YORK CITY.—Diseased thyroids occur about eight times more frequently among women than in men. It is to be expected, therefore, that the gynecologist, especially in the so-called thyroid belts, should, in the practice of his specialty, encounter many patients with thyroid complications. In the presence of a goiter one may assume a change or upset in the thyroid function; but the nature and direction of such an upset is a matter for careful study. Toxic goiter, if the expression is to have its specific meaning, indicates the presence at least of an increased metabolic rate resulting from the thyroid dysfunction. All too frequently thyrotoxicosis is adjudged present without even an attempt being made to determine the basal metabolic rate. Dr. Smith, in his paper, has given us a very comprehensive symptomatology of the condition recognized as Graves' disease, and he emphasizes the basal metabolic rate as the final arbiter in the diagnosis. There is a great deal of confusion and contradictory evidence as to the physiology and pathology of the endocrine glands. Apparently, the genesis of toxic goiter has no definite relation with pelvic disease save a possible exception of a regional infection being a significant factor in the production of thyrotoxicosis. Geist, at the Mount Sinai Hospital, found no change in the metabolic rate after ovariectomy, and Corseaden, at the Sloane Clinic noted that the metabolic rate is unchanged after sterilization by the use of radium and the x-ray. As Dr. Smith has pointed out, the usual gynecologic cases call for secondary consideration in the presence of toxic goiter. The treatment of the toxic thyroid state has today taken on the status of a specialty in medicine. There are elements calling for the experience of the internist with the use of iodine therapy, the radiotherapist, and the surgeon. The method of choice in the treatment depends on the particular factor in that case. For the gynecologist, his chief concern should be the recognition of the toxic state in patients under his care and the use of approved procedures in establishing a correct diagnosis. In the Sloane Clinic, toxic thyroid or toxic goiter cases have been rare, but a condition noted which closely simulates thyrotoxicosis which may be due to ovarian deficiency. The patients usually were in their thirties, showed a marked degree of nervousness and irritability, some tremor of the hands and tongue, sweating, moderate enlargement of the thyroid, slight loss of weight, frequently hot flashes; all of which symptoms were exaggerated about the time of menstruation. Repeated basal metabolic tests, after some days of rest in bed, failed to show any significant elevation, and in some of these cases good results have been obtained by using the whole ovary preparation together with small doses of thyroid extract. I could find but few cases of proved toxic thyroid among our gynecologic cases. In the obstetric service, where all patients showing any complications are studied by the medical department, twenty-two cases of toxic thyroid in the last six thousand cases have been found. The majority of

these have carried through to term and been delivered of living children. Five of the twenty-two had to be aborted on account of the seriousness of the condition. Three of the ones that were aborted improved after the abortion; one was lost track of, but her condition was unchanged when last seen by us; the other patient had serious bleeding at the time of the operation and died a few days later.

DR. ARTHUR H. CURTIS, CHICAGO, ILL.—Within the last two or three years I have been surprised at the number of borderline cases with symptoms of toxic goiter. Whether we have been overlooking them in the midwest, or whether the situation has changed materially in the last few years, I do not know. I am rather inclined to think that we have been overlooking them and that the basal metabolic rate has informed us that we have been negligent in making diagnoses. This means of information is used as a routine whenever we have a patient in whom the diagnosis is complicated or difficult.

We have a group of patients who, despite nervousness, have a markedly *decreased* rate, and in whom the administration of small doses of thyroid extract has been materially helpful. In common with others we have learned that many patients who are tired or sluggish are distinctly below normal in their thyroid activity. But above all I wish to emphasize that this class of patients may, on the contrary, have symptoms that simulate toxic goiter; in these cases thyroid extract in small doses is particularly beneficial.

DR. CARL HENRY DAVIS, MILWAUKEE, WIS.—My first experience with this condition was some fifteen years ago when a patient came into the hospital believing that all her trouble was due to a relaxed perineum and a lacerated cervix. Examination showed that she had a typical toxic goiter of the exophthalmic type. However, we could not get her consent for treatment of the thyroid disease until after she had had something done for what she thought was wrong with her. During the last fifteen years I have seen a good many borderline cases where it was often difficult to determine whether the symptoms were due to the pelvic conditions or to something else. I have come to believe that in our gynecologic work we must eliminate all other possible reasons for the symptoms before advising operative treatment.

It is not necessarily a hyperfunction of the thyroid that is causing trouble, it may be a hypofunction, and may fluctuate from one to the other. After a period of mild hyperthyroidism the patient may come back a year later with symptoms, but suffering from hypothyroidism. It is not always necessary for patients who have relatively small thyroids and mild symptoms of exophthalmic goiter to have surgical treatment, because with rest, sedatives, and iodine for a number of weeks, the symptoms will clear up, and the metabolic rate will return to normal. Some of these patients later return with mild hypothyroidism.

DR. G. BROWN MILLER, WASHINGTON, D. C.—A number of years ago, before the metabolism test came into vogue, I was working in the gynecologic dispensary in one of our hospitals in Washington and a patient was sent in from the medical dispensary with a diagnosis of exophthalmic goiter. She had the typical symptoms: rather an acute enlargement of the thyroid gland, some exophthalmus, rapid pulse, nervousness, etc. She was sent in because she complained of pelvic discomfort. I found a large retroverted uterus, put it in position, put in a pessary, and sent her to the country. She was also given iodide of potash. She came back to us in a few months, the enlargement had disappeared, the exophthalmus had largely disappeared, she was no longer nervous, and the uterus was in good position. I did an operation for permanently restoring the uterus to normal position, and she has never had a symptom of exophthalmic goiter since.

DR. JAMES C. MASSON, ROCHESTER, MINN.—We see a great many cases with the coexistence of a pelvic condition and toxic goiter. It is of great importance to differentiate between exophthalmic goiter and the toxic adenoma. The two conditions are absolutely different, and the preoperative management is different.

In the exophthalmic goiter, improvement can be obtained in every case by the administration of Lugol's solution; in the other type this is unsatisfactory. In some cases it has no effect, in other slight improvement is noted, and in some the condition becomes worse.

I believe that sometimes the two conditions coexist to some extent in the same patient. We feel at the Mayo Clinic that any toxic condition of the goiter should be taken care of before any other operation is done, and it is seldom in gynecologic conditions that this rule need be changed, because a little time will not make much difference. These patients can all be made better, and surgery on the thyroid is no longer considered a serious operation. Patients can be out of bed from the third to the fifth day.

As to the cure of exophthalmic goiter without operation, there is no doubt that an occasional case of definite thyroid of the exophthalmic type undergoes a spontaneous cure. In the British Isles, at least until recently, they seldom thought it necessary to operate because these cases, under medical management, frequently ran a short course with no tendency to recurrence. Our experience has been that exophthalmic goiter has a marked tendency to recurrent attacks; that is, there will be a period when there will be a definite crisis, the patient will improve and be in apparently normal health for some months, then there will be another crisis. In the toxic adenomatous type there is, of course, a constant downward course.

DR. JOSEPH L. BAER, CHICAGO, ILL.—Just a word of caution. It is so easy to prescribe Lugol's solution or thyroid extract that perhaps many of you have done what I have done in the past, undertaken to handle a mildly toxic thyroid simultaneously with office treatment for gynecologic conditions. After several unhappy experiences I subscribe to the idea of the surgeons, that the administration of Lugol's solution to a toxic thyroid patient has only one purpose and that is preparation for thyroid surgery. If the administration is continued over a number of weeks that patient is likely to be precipitated into a condition that will make her a very bad risk surgically, whereas, if it is brought to a climax rather quickly and followed promptly by surgery the result will be much more satisfactory.

DR. FRANK W. LYNCH, SAN FRANCISCO, CAL.—I had hoped that the discussion might bring out the relation that appears to exist between the thyroid and fibroids, in patients who do not live in thyroid districts.

Recently I have had the opportunity of studying six hundred cases of fibroids in my clinic. I divided them into large and small tumors, although as the former, we considered those which in the past would not have been considered so large, that is, tumors the size of a four months' pregnancy, or too large to be treated with radium. Twenty per cent of the fibroid cases had some goiter, adenoma, or an enlarged gland. This is of interest since California is not a goiter country and only few came from goiter districts or pockets. It also is of interest that the goiters were twice as frequent in the so-called large fibroid group as in the smaller tumors. As we review the literature of fibroids, we must acknowledge that the etiology given us in the past for these tumors does not stand up under the modern tests, and that a close relation between the thyroid and ovary is now universally recognized. Thyroid enlargements are common at the time of menstruation and during pregnancy. If they occurred as often with old pelvic inflammations as they

did with fibroids, I would have found them as often in the group of small tumors as in the larger ones, since the majority of the patients with small tumors had old pelvic inflammations.

DR. WILLIAM S. STONE, NEW YORK CITY.—At the thyroid clinic at the Memorial Hospital in New York we not infrequently see a patient who has perhaps been doing fairly well under treatment for the thyroid, but uterine bleeding occurs. An examination reveals a uterine myoma. It is frequent enough to make this subject worthy of our serious consideration. What the relationship is, if any, I do not know. Of course, we have so many women with uterine fibroids, it is not, perhaps, strange that they should appear among a large number of thyroid cases, but they do occur synchronously, and the uterine hemorrhage is a disturbing factor in the course of the toxemia, so that the question of how the fibroids are to be treated, often offers a problem.

It is in some of those cases that we have occasionally used radium or x-ray for stopping the uterine bleeding, so that the treatment for the toxicity due to the thyroid may be continued. The tumors are not usually large and an undesirable operation may be thus avoided.

DR. J. HOFBAUER, BALTIMORE, MD.—Although the local conditions largely affect the conceptions of the individual investigator, we may now conclude, on the basis of present knowledge, that thyroid intoxication in general exerts an effect primarily on the heart and on the liver, as recently shown by Youmans and Warfield. The extent of the impairment of liver function was determined in their investigations by Rosenthal's test and it became evident that the glycogen formation was markedly interfered with. Thus, the glycogen-poor liver, resulting from thyrotoxicosis, may be more susceptible to an additional damage by some toxic agent, anesthesia, etc. (See *Archives of Internal Medicine*, 1926, xxxvii, No. 1.)

Bearing in mind that there exists an interrelation between all endocrine glands and that clinically thyroid disturbances are not infrequently associated with menstrual abnormalities, our search was directed toward influencing abnormal ovarian function by x-rays, applied to the thyroid, the hypophysis, or the spleen. An experience in Döderlein's clinic showed that spleen radiation should be principally employed for prompt stopping of hemorrhages, particularly when due to fibroma or incident to the climacterium. Radiation of the liver is sometimes effective even when the radiation of the spleen has failed to stop profuse menstrual bleeding in young women after unsuccessful curettage. In cases of dysmenorrhea and amenorrhea, radiation of the hypophysis rendered a valuable service. A prompt effect of radiation of the hypophysis was often seen in women in whom menstruation occurred at short intervals or was too free. As a matter of fact, in certain refractory patients of this group the radiation of the thyroid succeeded. The decrease in size of an enlarged thyroid after radiation of the hypophysis, as occasionally observed in our series of cases, bears directly on the pituitary-thyroid relationship.

DR. HUGO EHRENFEST, ST. LOUIS, MO.—It is my belief, that the climacteric patient who is seeking relief for her rapidly increasing weight requires particular attention. As a rule, increased thyroid function expresses itself in a loss of weight, but in the case of the climacteric patient, with the general upset in metabolism, occasionally increase of weight might be associated with increased thyroid activity. To give such a patient thyroid extract carelessly might prove disastrous.

DR. SMITH (closing).—The purpose of this paper was simply to direct the attention of gynecologists to this very important disease, to point out how we may recognize it in the course of an examination, and to comment on certain other

facts that I thought were of importance in this connection. In the outspoken case there is no difficulty in diagnosis, but it is the rather obscure and doubtful case we are apt to overlook and I had this in mind when writing this paper. We do not know the reason for having so much toxic goiter in the Middle West, but certainly there has been a great increase in the number of such patients during the last few years. Part of this undoubtedly is due to the education of the public and the profession, but there can be no question that there is an actual increase in frequency. Some of us think that the promiscuous use of iodine may have something to do with it. Many of our people are taking iodized salt and many patients with goiter are taking iodine in some form. We believe, of course, that iodine should be taken only under a physician's care, and its dangers in causing toxicity in those with goiter should ever be borne in mind.

DR. ROBERT L. DICKINSON, New York, N. Y., presented a paper entitled **A Gynecologist Looks at Prostitution Abroad**. (See November issue, page 590.)

#### DISCUSSION

DR. GEORGE W. KOSMAK, NEW YORK CITY.—We are very much indebted to Dr. Dickinson for having the courage to bring before this Society a topic which has unfortunately been sidetracked by the men who should have displayed the greatest interest in it, namely, the gynecologists.

There are two large aspects from which this question must be viewed,—the social and the medical. The people who have taken up the social aspect have gained rather the greater attention, but comparatively few have had either the desire or the courage to take up the strictly medical aspects of the matter. Dr. Dickinson has well shown that greater attention on the part of the gynecologists should be secured.

There is another field open; namely, a greater correspondence of effort between those who treat the male and those who treat the female suffering from venereal diseases. I think it would be well if our local obstetric societies could have joint meetings with the genitourinary specialists, to take up this important topic.

Gonorrhea is a great deal more important than syphilis, and I differ with Dr. Dickinson in claiming that it is a simpler matter in the male than in the female. The posterior urethra in the male is difficult to treat, and it is because of the difficulty of the treatment and the insidious character of the lesions that the disease itself has become so widespread. The male patient has been neglected. The ordinary man who has had an attack of gonorrhea goes to his physician and in a short time is pronounced cured, and yet I have seen these men several months after marriage come back with exacerbations of an old uncured gonorrhea.

Again, the regulation of prostitution will not solve the problem. We occasionally find women who will not lend themselves publicly to this sort of thing but who are a chronic and constant source of infection, although they cannot be regarded as prostitutes, and it would be difficult to get them to consent to treatment. There is lack of attention on the part of most women to minor degrees of vaginal discharges, to which Dr. Dickinson has called attention. I believe, moreover, that in a great many instances, gonorrheal infections date back to childhood where a vulvitis has caused the infection to center in the cervix where it remains quiescent for years, and after puberty it again becomes evident.

DR. J. WESLEY BOVEE, WASHINGTON, D. C.—I agree with Dr. Dickinson that our best means of treatment is the galvanocautery with the fine wire, such as the laryngologists use in the nose. But that is not the formula that is equally recognized



by all workers in this field. There are modifying conditions that have to be considered; for instance, whether the infection is in the lower or upper part of the cervical canal.

Dilatation of the cervix is a necessity as a preliminary to the application of the cautery, whether we do it with or without the aid of general anesthesia. I also think it is better to do too little cauterization the first time rather than too much. It is better to use three or four applications in cauterizing the cervical canal than to overdo it and produce a constriction.

DR. CHARLES C. NORRIS, PHILADELPHIA, PA.—It may sound heretical but it is my firm belief that the average case of cervical gonorrhea undergoes spontaneous cure in three years or less, provided reinfection does not occur. This question of reinfection is an important one and I believe accounts for the marked resistance to treatment often exhibited by this disease.

I am not in accord with the belief that gonorrheal vulvovaginitis frequently persists and causes salpingitis. Gonococcal vulvovaginitis is an extremely frequent disease among female infants and young girls. I believe the infection usually disappears with the development of the lining membrane of the vagina prior to the onset of menstruation. Were such not the case, cases of gonococcal salpingitis developing in girls prior to defloration would be of frequent occurrence. As a matter of fact, gonococcal salpingitis is a relatively rare disease in the presence of an intact hymen.

One essential in the treatment of gonorrhea of the lower genital tract in women is to check reinfection. If this cannot be accomplished the success of the treatment is greatly hampered and indeed local applications under such circumstances are almost useless. I have tried almost all the methods of treatment which have been suggested and believe that the genital tract can be made gonococci-free quicker by the use of the cautery than by any other method. It is not enough, however, to treat the cervix; Bartholin's glands and the urethra should be treated also. All these are harboring places for the gonococci, and it is illogical to treat only one of them. For this reason, I prefer to give an anesthetic, lay open and cauterize Skenes' tubules, excise Bartholin's glands, and cauterize the cervix at one sitting. Entire eradication of the gonococci from the lower genital tract can be hastened by judicious postoperative treatment.

The use of the cautery is not without risk; if the integrity of the internal os is destroyed there is danger of an extension upward of the infection. If a mild quiescent salpingitis is overlooked there is danger that cauterization may light up the condition, and finally, occasionally patients may develop quite severe hemorrhage from the cauterized area subsequent to the operation, when the slough separates. For these reasons cauterization should not be performed except by those skilled in gynecologic technic.

DR. FREDERICK C. HOLDEN, NEW YORK CITY.—Where the cautery has been used unsuccessfully, I think it is because the details of the use of the small cautery snare and knife, as perfected by Dr. Dickinson, have not been understood. It is quite essential that the external os be dilated. Very frequently we will find a small os with a large canal above it. If an attempt is made to cauterize in such an instance, one cauterizes the external os too radically, thereby getting more constriction than is needed.

I agree with Dr. Norris that many cases of gonorrhea in women are self-limiting and will cure themselves. I believe that gonorrheal vulvitis in young girls is quite a different disease, in most instances at least, from that of women. Otherwise, I think we would have a great many blind children, because children with vulvitis would convey the infection to their eyes.

DR. EDWARD A. SCHUMANN, PHILADELPHIA, PA.—I agree that gonorrhea seems to be a self-limiting disease, only the aftermath of the condition as represented by adhesions about the tube, constriction, etc., remaining.

A note of warning about the use of the cautery. I think it should not be practiced while gonorrheal endocervicitis is in its acute stage, because while the gonococci are still virulent, mixed infection takes place and the cautery may open up lymph channels and produce a rather severe pelvic cellulitis.

I would like to call the attention of the Society to the gonophage, a substance generated by cultures of the bacteria and which when injected in cases of gonorrhea seems to limit the infection. It seems to be shown definitely that by this new method disappearance of the gonococci can be brought about even though they may be in latent foci. The recent paper of Pelouze and Schofield presents the subject in a most complete and interesting fashion.

DR. JOHN A. MCGLINN, PHILADELPHIA, PA.—I have had a rather unusual opportunity of studying vulvovaginitis in children and I am rather in accord with what Dr. Norris has said about the self-limitation of this disease in children.

At St. Vincent's Hospital, which is a combined maternity hospital and orphanage, we have about four hundred children. I have come to the conclusion that treatment of this condition in children is not of very much use, and all that we can do now is to isolate these children and keep the parts clean. These children eventually become gonococci-free, and they are transferred to another institution so that we are able to follow them until they are 15 or 16 years of age. We find no further evidence of gonorrhea, showing that the condition is not progressive; it stops at a certain time.

At this same institution we have a splendid opportunity of studying gonorrhea associated with illegitimacy. We deliver about four hundred illegitimate women a year, and last year out of that number we had 228 positive gonococcus infections of the cervix. We have learned that it is best not to treat gonorrhea of the cervix during pregnancy, but simply to keep the cervix clean. In the hundreds of these cases we have not yet lost a single eye at that institution, because the eyes are routinely treated at birth. And we have not had a case of blindness.

So far as the treatment of the adult cervix is concerned I am somewhat in despair. We have used almost everything and yet can get negative smears for a short while no matter what treatment we use, and our index of a clinical cure is that we are able to obtain negative smears from the cervix and from the glands. However, the condition is not actually cured, because we find it recurs when these women have gone out and reinfected men, although there has been no evidence of the trouble so far as we could ascertain. We secured negative results in one hundred cases after treatment, but they all came back again. At the present time we are following the method of Dickinson, using the small cautery, and that seems more promising than anything else.

DR. HARVEY B. MATTHEWS, BROOKLYN, N. Y.—It seems to me that the proper way to handle this condition from a prophylactic, as well as from a remedial standpoint, is to have venereal departments in our hospitals and dispensaries; and then to work in closer cooperation with these departments. Dr. Norris made two important statements: first, that gonorrhea is a self-limiting disease, and secondly, that reinfection may occur from the man. Gynecologists cannot treat the infected man properly, but the urologist can, and will, if we will cooperate by referring the case.

DR. CARL H. DAVIS, MILWAUKEE, WISC.—We turned over the treatment of gonorrheal endocervicitis at the Milwaukee County Hospital to Dr. Harold Shutter and started him with the cautery treatment for chronic cases. He has thus far

cleared up the infection in over three hundred women. They are not discharged until all evidence of infection from the glands and from the cervix has been eliminated. Our test of that is getting rid of leucocytes and extracellular organisms as well as the intracellular gonococci.

The difficulty with prostitutes is that they may become reinfected within a few hours after they leave the hospital. This is one great drawback in this problem. Private cases may accidentally become infected, but I believe we can clear up gonorrhea in women if coitus can be prevented for a sufficient length of time.

DR. DICKINSON (closing).—Dr. Bovee spoke of the effect of leaving glands untouched. I showed in my paper that three to five millimeters beyond the area treated would show a sterilizing effect.

Everybody believes, as Dr. Norris has said, that in many of these patients the gonococcus will disappear, but will leave behind it, however, a mixed infection, an endocervicitis, lasting over a number of years, and there again the cautery has its place.

DR. I. C. RUBIN, New York, read a paper on **Rhythmic Contractions of Intact Human Fallopian Tubes as Determined by Periuterine Insufflation and the Kymograph, a Clinical, Experimental Study.** (For original article see November issue, page 557.)

#### DISCUSSION

DR. BROOKE M. ANSPACH, PHILADELPHIA, PA.—There have been 632 cases at the Gynecologic Service of Jefferson Hospital. In 344 the test was positive; in 288, it was negative. We have performed laparotomy in 138 of these patients; 27 others subsequently became pregnant and confirmed our findings by the Rubin test. In these 165 cases of which we have positive knowledge, the observer's report was erroneous in but 3.8 per cent. In five cases regarded as Rubin negative, laparotomy did not disclose any gross tubal pathology. Four of them had retroflexio-version; the other had definite endometrial hypertrophy.

I have no doubt that the kymograph will add to our ability in making accurate diagnoses. So far as unfavorable results following the Rubin test are concerned, there have been almost none, but we have carried out the most careful asepsis and selected the patients with much care. In one instance in which an insufflation was made just preceding dilatation of the cervix, we produced a pneumosalpinx; it was recognized by palpation, and a laparotomy was done immediately. In one case a pneumosalpinx was suspected, but as there was no permission for operation, none was performed, and the condition subsided in a few days. There was one definite inflammatory reaction with elevation of temperature to 101.2° and a definite leucocytosis; this subsided, and the patient was subsequently operated upon.

There was one case of severe pain and fainting about two hours after the test. There was no elevation of temperature or palpable mass and the symptoms subsided (it is assumed that a tube had been distended with gas) within twenty-four hours; there were several other patients who complained of discomfort continuing over a period of two weeks with no severe inflammatory reaction. One of the earlier patients suffered with rather severe shock from the injection of about 700 c.c. of gas. The quantity is now limited to 120 c.c.

So far as the injection of opaque substances into the tube is concerned, we personally prefer 12 to 20 per cent sodium iodide which casts a good shadow, is not expensive, can be used in a burette with attached manometer and carefully regulated pressure. The tubes must have previously been demonstrated as closed. Care must be exercised to exclude air from the tubing and cannula.

A total of seventeen cases has been subjected to uterotubal roentgenography. In four of these cases it was used subsequent to operation and demonstrated already known uterotubal conditions. Nine cases have been operated upon subsequent to roentgenography; all these revealed pathology compatible with that shown by the x-ray film. Any error in diagnosis has been due from misinterpretation of the x-ray film. The remaining four cases have not yet been subjected to operation.

It has been observed that pain is more marked when fluid is injected than when gas is injected; secondly, that any leakage into the peritoneal cavity is liable to be accompanied by marked irritation, as occurred in one case. In this instance, however, the pulse and temperature remained normal, the discomfort subsiding within twenty-four hours.

DR. FREDERICK C. HOLDEN, NEW YORK CITY.—Shortly after Dr. Rubin's contribution to this subject, I began the use of this method at Bellevue Hospital, and thus far have had no morbidity.

Up to that time I had considered it adequate if gas went through the tubes at a certain pressure. Dr. Rubin explained that he had operated upon patients, where gas had gone through, but where there had been no kymographic fluctuations. At operation, such tubes were found adherent along their entire length. This showed that patency of a tube is not in itself proof of its normal function.

DR. ROBERT L. DICKINSON, NEW YORK CITY.—In a study of sterility abroad one naturally searched for those clinics that were doing the Rubin tubal insufflation test. The work in England, I take it, is being carefully done, with due consideration for the patient. The work in Paris is being done in four clinics. I have seen patients treated without gloves, and one would appreciate that if any accidents occurred in that clinic they would not be due to the method but to carelessness. If the method has received discredit in Germany, it is not the method that is to be blamed. No wonder they have had untoward results and are fearful of using it after some of the accidents they have had. These reports do not reach the American literature.

DR. EMIL NOVAK, BALTIMORE, MD.—I should like to ask Dr. Rubin about the interpretation of these pressure fluctuations, as to excluding the factor of intra-abdominal pressure, especially as modified by respiration. The generative canal is of course in direct continuity with the abdominal cavity through the fimbriated end of the tube, so that it is reasonable to suppose that fluctuations in the intra-abdominal pressure would be registered in the tube as well. The pelvic diaphragm moves up and down with each respiration, just as does the upper diaphragm, as one can readily observe in the speculum examination of women, especially those with relaxed outlets. It seems very possible that these respiratory excursions might influence the pressure curve. I did not notice, on the graphs which Dr. Rubin showed, any marking to indicate the length and frequency of the contraction waves. This might throw light on the origin of the waves. If they are not of the same frequency as respiration, the latter factor could hardly be the important one. If they are due to tubal peristalsis, one would expect them to be infrequent and prolonged, for involuntary muscle contractions, such as those of intestinal peristalsis, exhibit a long latent period, with prolonged contraction and relaxation.

DR. RUBIN (closing).—My paper was, to be sure, experimental in its substance but at the same time with an eye to its clinical value. There are a number of things of clinical importance that will occur to us as we take up this work.

Dr. Novak's question bothered me a great deal and there is one thing in a negative way that will answer that point: In patients that I have personally operated upon where the kymograph showed practically no fluctuations although

patency was present, the tubes were adherent. In such a case why does not physiologic intrathoracic and intraabdominal pressure cause fluctuations during the uterine insufflation? The reason for this absence of fluctuations in the manometer is due to the fact, which was brought out by other work that I have been able to do, that the tube is rigid; it is bound down; it is not free to act. Now during insufflation I have repeatedly asked the patient to bear down voluntarily or to hold her breath; to take quick breaths or to breathe slowly and deeply and have then noted the impression of these physical efforts made upon the kymograph. These efforts can be noticed on the drum and are recorded *only when the tubes are patent*. When the tubes are not freely patent a voluntary effort can also register a definite rise in pressure because as soon as the stenosed tubes permit the passage of gas through them into the peritoneal cavity the latter may be compared to a large balloon which is in direct air-tight continuity with the source of the gas pressure at the gas tank. Any motion or pressure on top of that "balloon" by the diaphragm or abdominal muscles will naturally record a change in pressure. This most likely explains the secondary waves of contraction which are noted in the regular kymographic tracings of normal tubal patency cases.

According to Dr. Peterson's early practice I have been able in two patients to introduce the gas through abdominal puncture and that kymographic record is so entirely different from anything that is noticeable by ordinary tubal insufflation that there is no question but that the one is due to respiration and the other to something inherent in the tube itself.

*(To be concluded in January issue.)*

## NEW YORK OBSTETRICAL SOCIETY

MEETING OF MARCH 8, 1927

DRS. ROBERT T. FRANK and S. H. GEIST described **The Formation of an Artificial Vagina by a New Plastic Technic**. (For original article see page 712.)

### DISCUSSION

DR. R. T. FRANK, supplementing Dr. Geist's presentation, said that these cases are rather tragic as a rule, because some of these women marry, perhaps without knowing of their great disability, and divorce, of course, is a very common consequence.

On the other hand, we have all encountered young women who are aware of their defect, who are unmarried, and who desire to know whether their disability can be cured. In these cases, heretofore, he hesitated, especially in young women who had no marked sexual desire, to propose either the Baldwin operation or the almost as dangerous and more distasteful Schubert operation.

Dr. Frank wanted to bring out that this woman had libido, and before operating upon her he assured himself of the fact that she had functioning ovaries, by finding the female sex hormone in her blood.

Although there is a liberal amount of covering to the newly-formed canal, it is advisable for these patients to use a speculum at frequent intervals, leaving it in place for twelve hours at least, or they can leave it in place during the night, to prevent the primary contraction which takes place in every scar.



DR. ROBERT L. DICKINSON read a paper entitled **The "Safe Period" as a Birth Control Measure.** (For original article see page 718.)

#### DISCUSSION

DR. R. T. FRANK said that these studies will enlighten and perhaps show us that there is really a safe period and it must be seriously considered. In analyzing human material we meet with extremely many difficulties.

Dr. Frank felt inclined to venture the opinion that the acme of sex desire in the human female corresponds to the time when most of the hormone is circulating in the blood just before the onset of menstruation. Possibly within a short time we may be able to show more positive evidence by injecting an active hormone into frigid women and seeing whether any corresponding stimulation of the sex desire occurs. In further analysis we must remember that while the ovum is going down in the tube the spermatozoon must be ascending, and we have to keep in mind, then, the time of viability of these two structures. The evidence is somewhat conflicting. Dr. Frank believed that in the closed follicle before its rupture, the female sex hormone is enclosed in the follicular sheath. With the rupture of the follicle this concentrated hormone is poured out into the peritoneal cavity and is rapidly absorbed. Furthermore the corpus luteum continues to secrete the hormone, and pours it out into the blood-stream. Bearing this in mind, it would appear that ovulation occurs about as follows: Four days for menstruation in a 28-day cycle; that leaves 24 days. The hormone is demonstrated in the blood, as a rule, about 10 days before the expected period, and that comes very closely, then, in correspondence with the anatomic findings that ovulation (rupture) occurs about two weeks after the completion of the preceding period.

However, although our increase in knowledge in the last few years has been very rapid, Dr. Frank did not believe that we would settle the question in the human female definitely, especially for each given case (because each woman is a law unto herself) until we get the vaginal spread method to the point that it applies to the human female. If the epithelial lining of the vagina and consequently the spreads we obtain in the vagina, can be formulated to give us an idea of what is going on in the ovary, then we will be in position to do so; but the fact that in a large series of cases (from 7 to 10 per cent) impregnations took place in the least fertile period makes it very likely that there is no real safe period in the human female, and that if the very necessary birth control is to be established on a firm and workable basis it will depend upon the elaboration of some mechanical or chemical means of preventing conception.

DR. JOHN FRASER, Montreal, Que., (by invitation) presented a paper entitled **The Ovary in Osteomalacia.** (For original article see page 697.)

#### DISCUSSION

DR. R. T. FRANK said that the subject is a tremendously involved one. One reason is that osteomalacia is not confined to the female sex, for an identical condition occurs in the male in the regions in which female osteomalacia is also encountered, with a remarkable degree of frequency.

The second impediment in studying this condition is the fact that osteomalacia is a disease characterized by marked exacerbations and remissions which misled Bossi, for example, into believing that adrenalin was a cure for this disease. He probably was encouraged by meeting frequently the period in which the patient

normally, if you can use this term in connection with a pathologic process, would improve with or without treatment.

The third reason is that castration may act specifically, as perhaps we may find out at a later time, when the problem is clarified, but mainly because it abolishes pregnancy once and for all. As we all know, during pregnancy these patients, whether it is simply that they are inclined to osteomalacia, or whether it has been latent in them, as seems likely, have their most active period of the disease.

The one impression gained from Dr. Fraser's paper was that this problem will not be cleared up by morphologic study, but that it may be cleared up by intensive physiologic and pharmacologic investigation.

Dr. Fraser used the term "periglandular tissue," because "interstitial gland," which he only mentioned once in order to sum up this whole tissue, is very likely a misnomer; but at the present moment some work of Zondek's, in Berlin, has made us revise, at least temporarily, our opinion about this perifollicular tissue. Zondek by a very clever series of experiments, implants minute portions of the ovary, which he examines under the microscope, in castrated mice. By this means he believes he has shown that the thecal tissues, which are the same thing, namely, the tissue surrounding the follicle, appear to bring on a positive reaction in these castrated mice. If that is the case, we shall have to pay much more attention to this tissue in the future than we have heretofore. After many anatomic and morphologic studies, which may have misled us, we have gradually come to the conclusion that it is the glandular cells,—the interior lining, and not the exterior,—which are the active ones. If you remove from the ovary the corpus luteum and the large follicles that can be removed (the small ones cannot be removed) and extract the residue, its activity is greatly reduced, which is against the theory that the interstitial tissue is active.

This same Zondek has found that a problem in sex physiology, which has puzzled us completely hitherto, appears to be solvable and solved: Why does puberty set in? Apparently, an active extract of the pituitary gland at once starts an ovarian activity, a most startling fact, which is the first real proof encountered by Dr. Frank of the so-called interrelation of gland activity.

DR. FRASER (closing) said that the whole thing is in the melting-pot, and he has come to the conclusion that although he did not know anything about it, he liked to talk about it. He had the feeling that once in a while here in this country, although we do not see osteomalacia, we do see these peculiar malposed pelvis which are not caused by rickets, and it is possible—it is only possible—that some of them represent a mild change which we can cloak under the term of disturbed metabolism.

DR. S. A. COSGROVE, Jersey City, N. J., read a paper (by invitation) entitled **Spinal Anesthesia in Obstetrics**. (For original article see page 751.)

OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING JANUARY 6, 1927

DR. BERNARD MANN reported a **Fatal Case of Hypernephroma.**

Mrs. S. B., white, aged forty-two years, admitted to the Mt. Sinai Hospital, June 3, 1926. For the past year she complained of pain in the entire upper abdomen. For four months, the attacks were so severe that the patient was limited in her activities. For the past four weeks, she was confined to her bed because of the pain and general asthenia.



Fig. 1.—Hypernephroma of left kidney showing filling defect of upper part of pelvis of kidney.

The skin had a yellowish tinge, the conjunctivae were also yellowish. There were visible pulsations of the vessels of the neck. The lungs were negative. The heart was enlarged to the left, and a loud, rough systolic murmur was heard at the apex and transmitted to the left axilla. Abdominal examination revealed an enlarged liver and a subdiaphragmatic mass in the left upper quadrant. This mass was fixed and quite tender to palpation. Her appetite was poor, and she was nauseated after meals. She lost fifteen pounds in the past two months.

The temperature on admission was 102° F., and pulse 110, which continued during her stay at the hospital. There was no history of bloody urine. The hemoglobin was 55 per cent; R.B.C., 3,100,000; W.B.C., 9,600. Wassermann test was negative; urea nitrogen, 16; blood sugar, 120; icterus index, 17; platelet count,

40,000 per cubic millimeter. Blood culture was negative. The gastric analysis showed an achylia.

The cystoscopic examination revealed a congested bladder, capacity 250 c.c. Both ureteral orifices appeared normal. A No. 6 catheter met with no obstruction on its way to the pelvis of the kidney on either side. The urine collected from the right kidney, contained W.B.C. 1 per H. P. field, granular and hyaline casts; left kidney, W.B.C. 12 per H. P. field. There were few R.B.C. and many epithelial casts. A week later, the ureters were again catheterized, this time blood was seen escaping from the left ureteral orifice before an attempt was made at catheterization. The specimens of urine collected showed the following: Left kidney: bloody-colored, many W.B.C., and very many R.B.C. Right kidney: granular and hyaline casts, no R.B.C., no W.B.C. The urine from both kidneys was sterile. Both kidneys were injected with 12 per cent sodium iodide solution. The pyelogram revealed a filling defect in the upper part of the left kidney.

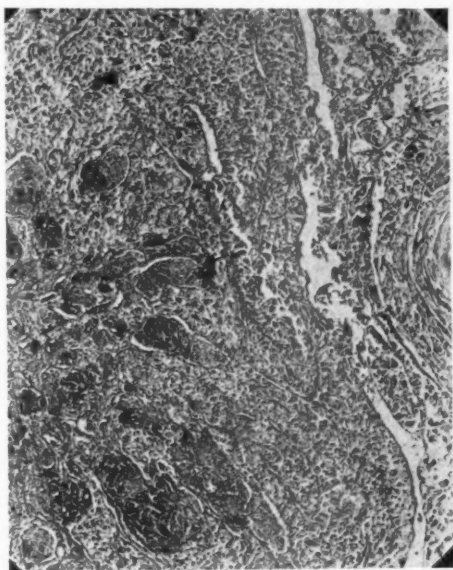


Fig. 2.—Hypernephroma of kidney showing characteristic large clear cells.

(Fig. 1.) The lower calyx was large and blunted, and the minor calices were obliterated. The outline of the left kidney appeared larger than normal. The right kidney was normal.

Patient died July 20, 1926. Postmortem examination showed the right kidney the seat of cloudy swelling, the left kidney much larger than normal, atypical in its upper half being very much larger than the lower, and irregular in its outline. The capsule was adherent. The cut surface showed a large tumor mass involving the entire upper part of the kidney, yellowish in color, and fascicular in structure. A section of this kidney showed the tubules very markedly dilated, with areas of leucocytic infiltration. (Fig. 2.) The tumor mass showed a picture of a typical hypernephroma. In both lungs, nodules were found, varying in size from that of a pea to that of a cherry, which on section proved to be metastatic hypernephroma. (Fig. 3.) The liver was larger than normal and was the seat of a chronic passive congestion. The spleen was twice the normal size and was the seat of chronic passive congestion.

This case presented some difficulties in diagnosis. Fever is not frequently observed. It was present only once in twenty-five cases of hypernephroma studied by Pleschner. The gastric symptoms and the enlarged liver pointed to a gastrointestinal condition. The mass in the left upper quadrant was thought of as being a carcinoma of the splenic flexure. The fact that she had no bloody urine, and the first ureteral catheterization was negative for blood seemed to indicate a renal tumor.

The pyelogram is a very important aid in the diagnosis. It will frequently reveal a characteristic deformity of the renal pelvis. The roentgen-rays may reveal the outline of the tumor mass, which is very suggestive, especially by comparison with the normal shadow, if obtainable, of the healthy kidney.

This case proves the necessity for thorough urologic study, including pyelography and repeated examinations in every case of obscure abdominal disease.



Fig. 3.—Section from nodule taken from lung showing characteristic hypernephroma cells.

DR. GEORGE W. OUTERBRIDGE reported the following cases: (1) **Ovarian Abscess Communicating With the Bladder**, and (2) **Curious Malingering in a Case of Ureteral Calculus**.

CASE 1.—Mrs. J. M., aged thirty-one years, gave the following history: For the previous eight years she had had gradually increasing hematuria. Usually only a few drops of blood were noted, but at times the patient voided almost pure blood. There was great frequency of micturition. In the preceding June she had, upon one occasion, been unable to void, and was about to be catheterized by her physician, when she spontaneously passed a large clot and was then able to void normally. About six months before, the cystoscope showed a moderate cystitis and urethritis, but nothing further, specimens of urine obtained by ureteral catheterization being entirely negative.

Examination of bladder urine on October 3 showed a large amount of pus, few red blood cells, and bladder capacity of three ounces. The irrigating fluid at first brought out large white flocculent masses, but soon became clear. There



was marked congestion of the trigone and fundus, with patches of intense scarlet congestion around the right ureteral orifice and on the right lateral wall, from which it seemed probable the hemorrhage might be coming. Both ureteral orifices were edematous and congested. Bladder irrigations and instillations of neosilvol relieved the patient's subjective symptoms somewhat, but pus and blood were still present in the urine.

A second cystoscopic examination on October 27 showed the bladder capacity to be six ounces. Otherwise the findings were the same as before, except that the areas of congestion were not quite so marked. Both ureters were catheterized and a good flow of pale, clear urine was obtained from each side. These urine specimens were entirely negative, showing neither pus nor blood, and were sterile on culture. Phthalein, given intravenously, was eliminated on each side in three and a half minutes. In one-half hour, 8.5 per cent was obtained from the right side and 17.5 per cent from the left. Except for this apparent reduction in function on the right side, the examination was thus negative so far as the kidneys were concerned, and not until a third cystoscopy was the true nature of the trouble discovered.

At this third cystoscopic examination, on November 21, the bladder capacity had increased to eight ounces. The catheterized bladder urine was very cloudy,

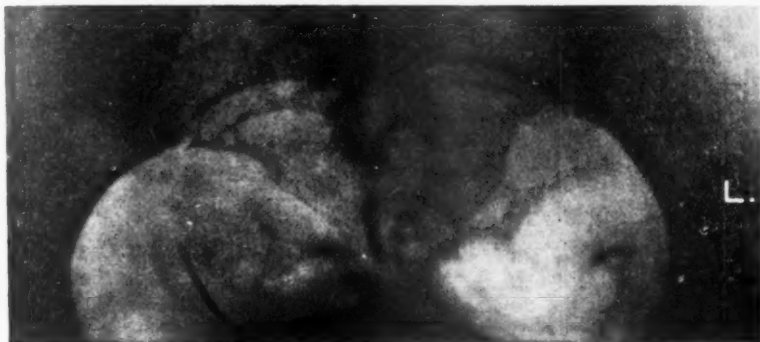


Fig. 1.

with small blood clots and large flocculent masses. The trigone, ureteral orifices, and areas of congestion were as before, except for increase in the edema. On depressing the ocular end of the cystoscope to the extreme limit possible, so that the instrument assumed an almost vertical position, there was seen on the posterior wall of the bladder, somewhat behind the air-bubble and to the right of the mid-line, what looked like a small irregular defect in the bladder wall, from the center of which a thick streamer of pus was hanging. On removing the cystoscope and making a bimanual examination, a distinct tender mass could be felt in the right vaginal fornix, which was diagnosed as a pyosalpinx or ovarian abscess. This either had not been so marked, or had been entirely overlooked at an examination made when the patient was first seen in October.

At a fourth cystoscopy, November 25, made in order to confirm these findings, the same area on the posterior bladder wall was seen, but no pus was exuding from it. An attempt to make pressure through the vagina on the right adnexal mass while looking through the cystoscope, to see if any pus could be forced through the fistula, was unsuccessful. However, after removing the cystoscope, making bimanual pressure on the mass, and then reinserting the cystoscope, a long streamer of pus was seen hanging into the bladder from the fistula. Considerable hemorrhage, which had also occurred, interfered somewhat with this second view.

An opaque ureteral catheter was then introduced into the fistulous opening, through which it could be passed for about 3 or 4 cm. The bladder was then filled with sodium iodide solution and a roentgenogram made (Fig. 1), which shows the dome of the bladder and the catheter passing beyond the limits of its wall to the right of the midline, thus absolutely confirming the diagnosis of an extravescical mass communicating by a fistula with the bladder and discharging pus into it. The blood was undoubtedly accounted for by the high-grade cystitis set up and maintained by the constantly recurring pus evacuation into the bladder.

The previous failure to find the fistula was undoubtedly due to its location high on the posterior wall, a situation that may truly be considered a "blind spot" in regard to examination with the ordinary type of indirect vision cystoscope, whose angle of view is at approximately right angles to the shaft. Unless the greatest care is taken both to elevate and depress to the utmost the outer end of the cystoscope while revolving the shaft to make visual sweeps around the bladder walls, this area will often be missed entirely, as had undoubtedly been the case here.

A few days subsequent to the last examination noted above, this patient was operated upon at the University Hospital by Dr. John G. Clark, who found a thick-walled abscess of the right ovary directly communicating through a fistulous opening with the posterior wall of the bladder. He removed the ovary and resected the portion of the bladder wall involved in the fistula. The patient made a good recovery.

CASE 2.—On January 17, 1923, Mrs. M. P., aged twenty-five years, was referred because of severe pains in the left lower abdomen. Pelvic examination was negative. Cystoscopic examination showed an essentially normal bladder. Indigocarmine given intravenously showed strong elimination from the right side in three minutes; very feeble elimination from the left side in about ten minutes. A catheter was easily passed to the right kidney, but on the left side it was impossible to pass one of any size farther than about 3 cm. above the ureteral orifice, and the x-ray showed an oval shadow just at the tip of the obstructed catheter. (Fig. 2.) A diagnosis was made of impacted calculus near the lower end of the left ureter. Three or four repeated cystoscopic examinations within the next month and numerous x-ray examinations, all resulted in identical findings, except for the fact that on subsequent examinations the indigocarmine elimination on the left side, while never quite equalling that on the right, became markedly improved, so that we felt justified in persisting in efforts to induce passage of the calculus. Attempts to dilate the ureter by the passage of a catheter or bougie beyond the stone uniformly failed, obstruction at about 3 cm. above the orifice being constant. Upon one occasion, a Bransford-Lewis metal dilator was passed up to the stone, and the ureter thoroughly dilated below this point, in the hope of inducing the stone to pass, but without avail.

After having pursued this course of treatment for about a month, the patient was told that operation would be necessary for removal of the stone. She became greatly agitated at this, objected strenuously, and on February 20 insisted on leaving the hospital, which she was permitted to do after being carefully instructed to examine all urine passed and to report at once if she voided anything resembling a small stone. About a week later she reported by telephone that she had done this, and on March 7 she returned to the clinic with the stone that she claimed to have passed. This was in fact just about the expected size and shape, but looked entirely unlike any ordinary type of renal or ureteral calculus. It presented the appearance of a smooth, hard, oval pebble, such as one might pick up on the beach or in a gravel pit. Examination of the patient showed the left ureteral orifice somewhat gaping (probably a result of the previous dilatations),

but the edges were smooth, and did not look as if a foreign body had recently passed through. Indigocarmine elimination was about equal in time of appearance and volume on the two sides, suggesting that possibly the obstruction had been relieved. On attempting to pass a catheter, however, it was arrested at the same point as before, and an x-ray showed the same shadow as previously seen. From these findings we felt certain that the patient was practicing a deception for which the only conceivable motive apparently was to induce us to tell her that she did not need an operation.

Having the old pain again, she was readmitted to the hospital six months later. X-ray showed the same shadow in the same place as before. A catheter was arrested at 3 cm. on the left side as before, but after a little manipulation it suddenly slipped past the obstruction and then went on up to the kidney pelvis. A pyelogram showed only a very moderate dilatation of the pelvis and slight blunting of the calices, in spite of the long-continued partial obstruction in the

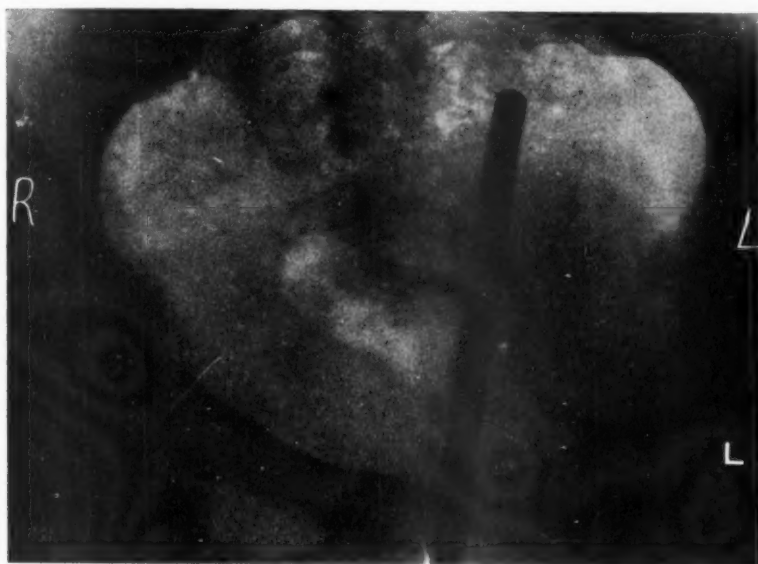


Fig. 2.

lower ureter. The following day a second catheter was passed alongside the first one, and these were allowed to remain in the ureter for several days in the hope that sufficient dilatation might be caused to induce the passage of the stone. An attempt to insert a third catheter failed, and the stone did not pass.

The patient now earnestly requested operation, which was performed on September 5, the ureter being exposed extraperitoneally through a Gibson incision. The stone was easily felt, and was removed in the ordinary manner through a longitudinal incision in the ureteral wall. Beyond the fact that a sinus developed which required a few injections of bismuth paste to secure healing, the patient made an uninterrupted recovery.

#### DR. GEORGE M. LAWS described **The Technic of Dilatation of the Ureter.**

The object of treatment is to restore permanently the lumen of the canal. Divulsion is unsurgical in that it wounds the tissue and invites the formation

of a cicatrix. Gradual dilatation may be intermittent or continuous. White and Martin taught us that the passage of an instrument through a stricture results first in hyperemia. Hyperemia is followed by softening and absorption of the inflammatory exudate and by atrophy of the fibrous deposit. The reaction lasts several days. With this conception it is logical to practice the plan of gentle, intermittent dilatation for the inflammatory and the congenital strictures and to reserve rapid dilatation for the calculi. Experience has shown that the dilatations should be gentle and that one should not attempt to do too much at one time or the reaction may be severe. The Garceau catheter and the silk bougie are the instruments of choice for routine work.

For rapid dilatation below a calculus the Buerger olives have been fairly satisfactory. The newer bags of Dourmashkin promise to be more efficient.

In order to remove a calculus after dilating below it Dr. Laws devised the plan of extracting it with multiple bulbs. For this purpose he made a set of bulbous, olivary tipped, whalebone, ureteral bougies. They proved successful. The bulbs have more often been used in the Gynecologic Service of the Presbyterian Hospital for strictures and minute ureteral orifices. The operator feels the "hang" and locates the obstruction accurately. By pulling instead of pushing he is more confident of safety and knows how much force he employs to effect a certain degree of dilatation.

Those who prefer the dorsal position and a fluid medium to the knee-chest position and air distention of the bladder have had technical difficulties to meet in dilating the ureter beyond 12 Fr. The problem has been simplified by passing first one of the whalebone, bulbous bougies beyond the area of obstruction and then a Garceau catheter alongside it. Traction on the bulb effects dilatation to an extent depending upon the level at which the Garceau catheter is held.

#### DISCUSSION

DR. LEON HERMAN believed that whalebone bougies designed by Dr. Laws, in the hands of a man of experience like Dr. Laws, are, no doubt, perfectly safe, but, in the hands of those less skillful, must be extremely dangerous, as it would be very easy either to make false passages in the ureteral walls at the site of a stricture or actually to perforate the ureter. Dr. Noble reported a case some years ago in which he passed a ureteral catheter through the ureter at the site of the stricture, the coiled-up end of the catheter having been found among the intestines at the time of operation. Impacted ureteral stones cause varying degrees of ureteritis and periureteritis, and both of these processes are markedly increased by the trauma incident to attempts to remove the stone by instrumental means. Dr. Herman did not mean that instrumental removal of ureteral stones should not be attempted, for cystoscopists succeed in removing 85 per cent of impacted stones, but in these cases in which failure with the method results, the inflammatory pathology at the site of the stone is greatly increased as a result of it. Several personal experiences lead him to believe that very careful discrimination is necessary between cases of impacted ureteral stones that should be operated upon at once and those in which one or repeated efforts at instrumental removal should be made.

DR. LAWS (closing) said that the method referred to was not intended for routine treatment of ureteral calculus, but it has been a valuable addition to the treatment of ureteral stricture.

DR. CHARLES MAZER read a paper on **Ureteral Stricture**. (For original article see page 761.)

## The Readers' Forum

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CONDUCTED BY JOHN OSBORN POLAK, M.D.

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Readers of the Journal are urged to avail themselves of the facilities afforded by this department for replies to questions in the domain of obstetrics and gynecology. All inquiries should be directed to Dr. John O. Polak, 20 Livingston Street, Brooklyn, N. Y. Replies to such inquiries will be published as soon as possible in this department.

*Editor.*—How soon after birth of the child would it be advisable to repair cervix cystocele and rectocele?

What is your belief concerning the use of pituitrin in the induction of labor?

E. B. VOGEL,  
BELLEVUE, OHIO.

*Doctor.*—The repair of childbirth trauma is an accepted principle, but the time for such repair is still a question of debate. Theoretically, the immediate suture of all obstetric lesions is ideal and should give pleasing results. Practically, however, owing to the severe tissue trauma and the usual accompanying edema, there is interference with the perfect union.

In all extensive injuries occurring in primiparae our best results have been obtained by waiting twenty-four hours, for, even in this short time the edema more or less disappears, the injuries can be better exposed, and their extent more readily appreciated; hence, the coaptation is more perfect, and suture constriction may be avoided. The most aseptic technic, of course, is imperative.

Bubis, of Cleveland, has, for many years, advocated and practiced the repair of the cervix, and the correction of cystoceles and rectoceles, by plastic operation immediately after labor, in multiparae who have been the subjects of previous obstetric injuries. His results have been excellent, but it must be remembered that he has rare technical skill. We have given his method a fair trial and can frankly state that plasties on the cervix at this time result in a smooth, conical cervix which favors uterine involution. The cystocele and rectocele repairs, however, have not given such excellent results. We have therefore postponed these operations in the afebrile case until the seventh day when the edema and vascularity of the tissues are less and the line of cleavage may be more readily discerned. A further advantage is that the uterus has undergone considerable involution and is less likely to become retroverted or retroposed than when the procedures are done at an earlier date, as it must be remembered that the vaginal walls and ligaments participate in involution.

Birth injuries left unhealed for lead to chronic invalidism from prolapse, displacement, and menstrual disturbances and predispose to local irritation or faulty drainage which, in turn, favor the development of cervix cancer.

Pituitrin for the induction of labor has many advocates, but it is not without danger to both child and mother. Extensive trial has shown that it is more or less unreliable in producing continuous rhythmic contractions. Different individuals have different susceptibilities to the effect of pituitrin; we have seen the uterus go into spasm from five minims and cause fetal asphyxia; we have also seen premature separation of the placenta occur from the employment of  $\frac{1}{2}$  ampule given hypodermically in the first stage of labor. From these experiences we feel that the employment of pituitary extract to induce labor is hazardous, and in view of the fact that we have so many excellent methods that are relatively safe we would advise that the best place for pituitary extract is in the third stage of labor rather than to induce it.



## Department of Reviews and Abstracts

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CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

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### Selected Abstracts

#### Radiology

**Borak:** Treatment of the Pituitary and Thyroid Glands by X-Ray for Loss of Ovarian Function at the Climacteric Period. *Münchener medizinische Wochenschrift*, 1924, lxxi, 864.

Patients of this type present a rather constant and usual picture as a result of the loss of ovarian function. At first there may be a definite increase of weight or a loss together with a transitory or persistent rise of blood pressure. Vasomotor symptoms are pronounced and there may be hot flashes, dizziness, a feeling of faintness, flashes before the eyes, dyspnea together with profuse perspiration over the body. There may be headache, migraine, peculiar pains of the muscles, eructations, constipation, pruritus especially of the vulva, parasthesias of the extremities.

Borak has treated 47 patients with favorable results, the pituitary body being radiated in 35 cases and the thyroid in 12. Other parts of the body, if radiated, apparently did not influence the results at all.

A. C. WILLIAMSON.

**Recasens, S.:** X-Ray Therapy in Endocrine Disturbances of the Sexual Apparatus. *Medizinische Klinik*, 1924, xx, 810.

Roentgen rays in large doses have been used to destroy malignant tumors, but now small doses of the x-ray are employed in cases of disturbed function of the genital apparatus due to insufficiency of the endocrine glands. The author has treated many amenorrheic patients with small stimulative doses of x-ray and is very well satisfied with the results, especially in young women. The application is made in the region of the ovaries, and 20 per cent of the erythema dose is used and repeated a month later.

More frequently than simple ovarian insufficiency, one finds associated with it an insufficiency of the hypophysis. These cases of amenorrhea are often confused with pregnancy, for the abdomen enlarges. In these cases good results were obtained by radiation not only over the ovaries but also over the hypophysis.

The results for dysmenorrhea were not as good. In these cases the fault is in lack of development of the anterior uterine wall, in consequence of which there is a pronounced ante flexion. The basic cause, however, is a diminished activity of the ovaries; hence, it is logical in these cases of dysmenorrhea to stimulate the ovaries. The best time to do this is before the twentieth year.

Ovarian insufficiency is frequently associated with hyperthyroidism. These patients have in addition to oligomenorrhea, vasomotor disturbances, headache, insomnia and palpitation. Here x-ray treatment of the ovaries and the thyroid is of great help.

In severe cases of metrorrhagia massive doses of x-ray are employed to produce roentgen castration. But there are cases of metrorrhagia associated with marked anemia which are not attributable to the gonads. These cases are best treated with the application of x-ray to the bone marrow. By this means one produces

an increase in the number of blood cells and the disappearance of the thrombopenia, which are the true causes of the blood loss.

In Doederlein's Clinic, the hypophysis is x-rayed to stimulate uterine contractions during labor. Since the action here is only temporary Recasens prefers to use pituitrin for the same purpose.

J. P. GREENHILL.

**Hirsch, I. Seth.: X-Ray Treatment of Ovarian Hypofunction, Surgery, Gynecology and Obstetrics. 1926, xliii, 659.**

The results of radiation treatment led to the conclusion that a certain dosage in carefully selected cases is capable of producing improvement in ovarian function, as shown by the regulation of the menstruation and the induction of pregnancy with the birth of healthy children.

There cannot be any objection to this form of treatment on grounds that the already diminished ovarian activity can still further be diminished by the small doses of radiation. If the condition of the ovary is such that this should actually take place, nothing is lost for such an ovary is incompetent to produce the menstrual mechanism or to produce an ovum capable of fecundation.

WM. C. HENSKE.

**Szenes, A., and Palugyay, J.: Radiation of The Hypophyseal Region For Ovarian Hypofunction. Wiener Klinische Wochenschrift, 1925, xxxviii, 503.**

Following the reports of Borak and of Sahler and Werner, the authors treated 38 patients in whom the menopause had been artificially produced by x-ray therapy, by radiation of the hypophyseal areas in order to bring about an amelioration of the symptoms. In 8 cases, 21.1 per cent, all symptoms disappeared in from two to three weeks following the series of treatments; in 24 cases, 63.1 per cent, the symptoms were markedly decreased; in 3 cases, 7.9 per cent, there was no change and in 3 cases, 7.9 per cent, the symptoms were increased. Subsequent examinations of 25 of these cases, three months following the treatment, showed over one-half to be free from symptoms or markedly improved. The relief following the third treatment was double that following the first treatment and following the fifth treatment was triple that following the first. Profuse sweats had been present in 24 cases and 16 had been markedly improved or had lost them entirely following the treatments. Four cases, which previous to radiation had not been troubled by sweats, developed them after the treatments. Of the 28 cases suffering from headaches, one-half were benefited, and in one case the headaches increased after treatments.

The authors recommend radiation of the hypophysis for menopausal disturbances but warn against too strong a radiation and insist on a careful clinical control of the symptoms, since some patients are made definitely worse by the treatment. They suggest that if no relief is obtained after the third radiation, the thyroid gland should be given a mild x-ray exposure and the patient should then be allowed to rest from six to eight weeks before repeating the treatments.

RALPH A. REIS.

**Uter: Roentgen Therapy in Tuberculosis of the Peritoneum and Genitalia. Zentralblatt für Gynäkologie, 1924, xlviii, 1473.**

This treatment has been adopted in a number of the German clinics, and presupposes a dosage insufficient to cause amenorrhea by its action on the ovary, the percentage of cures being higher where such amenorrhea is not induced.

The author analyzed the results in some twenty-four cases, and gives evidence of the value of the treatment. There is no mortality, and there are no resultant

fistulae. There is an appreciable improvement in the local and general condition and usually an increase in body weight. Where a diagnosis of tuberculous peritonitis is certain, no other therapy is indicated. Where necessary, the treatment may be undertaken subsequent to a conservative exploratory operation. LITTLE.

**Heyman, H. V. James:** *Technic and Results in the Treatment of Carcinoma of the Uterine Cervix at "Radiumhemmet" Stockholm.* The Journal of Obstetrics and Gynaecology of the British Empire, 1924, xxxi, 1.

In eight years previous to 1922 five hundred and five cases of carcinoma of the cervix were treated by radium unaccompanied by efforts at surgical removal. Previous to 1918 about 91.2 per cent of cases were inoperable or of the borderline type. Since 1918 the inoperable and borderline cases constitute only 68.4 per cent of the material. Nineteen per cent of cases were forty years of age or less (a highly malignant group). Twenty per cent of all cases, 16.6 per cent of the inoperable cases and 40 per cent of the operable cases treated previous to 1919 were alive five years later. All deaths occurring are considered as due to cancer.

As a rule two or three applications of radium are given in five weeks' time. Radium is placed both in the uterus (average total dose 2220 to 2640 mg.) and in the vagina (average dose 4500 mg.) The radium is filtered through 3 to 4 mm. of lead. All operative interference such as cauterization, excochleation and frequent biopsy is absolutely contraindicated. Treatment is never repeated in the first six months. Only one application is made if there is a recurrence at this time. If there is a local recurrence and the growth is operable, hysterectomy is done. Roentgen irradiation is used in conjunction with radium treatment if there are extensive glandular metastases, in the presence of recurrence in the parametria or where severe pain follows radium treatment.

Local recurrence, if it occurs, takes place usually within one year. Metastasis may follow years of apparently good health. In the absence of palpable recurrences, pain, anemia and fever usually indicate cancer tissue somewhere in the pelvis. Rectal complications following radium are usually due to an overdose and manifest themselves in tenesmus and hemorrhage about six months after treatment. The bladder is more resistant to an overdose than the rectum. There is a primary mortality of 1.19 per cent associated with the use of radium. Five of the author's patients died of general peritonitis and sepsis and one of pulmonary embolism. Changes in technic, larger doses over shorter periods, less frequent and meddlesome treatment and the accumulation of experience, are factors in the improved results seen year by year. H. W. SHUTTER.

**Gagey, J.:** *Curietherapy of Operable Cancer of the Cervix.* Bulletin de la Société d'Obstétrique et de Gynécologie, 1924, xiii, 22.

Gagey reports 14 cases of cancer of the cervix which were operable but which were treated by radium alone during the years 1919 and 1920. He believes that after a lapse of three years or more, recurrence is unlikely. Information concerning 10 of these patients was obtained in January, 1924, and 9 of the 10 were found to be alive and well. The tenth had died, seven months after radium treatment, of extension of the carcinoma into the parametrium and the rectum. In this group the number of spinal cell carcinomata which were cured equaled the number of basal cell carcinomata. In all the cases relatively small doses were used (about 20 millicuries with primary filtration of only  $\frac{1}{2}$  mm. of platinum). The only case where more filtration was used was the one which had the recurrence which ended in death. In one patient treated by the above technic there was *restitutio ad integrum*, for the patient later became pregnant and carried to term.

Another series of 10 cases was followed in which operation was performed soon after radium therapy. In these cases instead of the Wertheim operation, a total hysterectomy was performed because the author believes that if recurrences do take place they are usually found in situ rather than out in the broad ligaments. Of these 10 patients who were operated upon during 1920, eight were followed. Three of the latter had died soon after operation and one other patient died in 1923 of metastases. The results for the patients treated by hysterectomy were therefore much inferior to those treated by radium alone. The problem, however, is complex, for in three of the cases operated on after radium application active cancer cells were found.

Judging from these results, the author is tempted to treat operative cancer of the cervix by radium alone. Since, however, radium treatment a few weeks before operation does not render the operation more difficult and since the radium always sterilizes the uterus, one should combine radium therapy with operation; for some patients were saved who could not have been cured by radium alone. The author gives this as his opinion despite the unfavorable results which he had from such a procedure.

J. P. GREENHILL.

**Smith, Wm. Sidney: Gynecologic Conditions Treated With Radium Alone or Combined With Surgery.** *Surgery, Gynecology and Obstetrics*, 1925, xl, 598.

Radium, heavily screened with one millimeter of platinum and two millimeters of rubber and used within the uterus in 1200 to 2400 mg. doses, even with repeated administrations, causes no untoward effect on bladder and rectum and produces very little troublesome leucorrhea. The temperature reactions occasionally seen are more likely due to a fresh invasion by organisms started by the curetting and blocked drainage than to radium. Radium alone is an excellent treatment for chronic metritis and small fibroids at the menopause age, curing most of the cases with one 1200 mg. dose, but even a 2400 mg. dose will not always control the bleeding indefinitely in all patients. Plastic operations on cervix and perineum may be performed with excellent results at the same time that radium is applied to the interior of the uterus. For advanced cases of cancer of the cervix and corpus, radium, as a palliative measure, gives more relief than any other treatment at our command. In early cervical cases, the cautery operation and radium at the same session, with or without x-ray treatment later, give results which are so valuable that the combination should be thoughtfully considered as a possible standard method of treatment.

WM. C. HENSKE.

**Cheval: Vesicovaginal Fistula Occurring 48 Hours After Radium Application.** *Bruxelles Médical*, 1925, v, 5.

Patient, 44 years old, had severe hemorrhages. Examination showed carcinoma of the cervix the size of a hen's egg, with slight broad ligament involvement. Cystoscopy showed bladder irregularity and congestion but no neoplastic growth or ulceration. The patient received 10800 millicuries of radiation in the region of each broad ligament, over a period of five days, and 21600 millicuries in the vagina, over a period of nine days. In each case the radium was filtered by 1.5 mm. of brass, 0.2 of aluminum, and 2 mm. of rubber while the vaginal radium had an additional filter of 1 cm. of gauze. On the second day following the beginning of radiation a vesicovaginal fistula developed. Three weeks later a panhysterectomy was done, and two weeks following this an attempt was made to close the fistula, which failed. Three months later the vagina was closed, and a rectovesical fistula made; however, there was still some drainage of urine below the urethra. Twenty months later the patient had shown no signs of recurrence.

In discussing the case, the author points out that it is very improbable that the fistula was due to the radium but that it occurred more likely as a result of rapid infiltration of the bladder wall by the carcinoma.

THEO. W. ADAMS.

**Fürst: Preliminary Radiation in Carcinoma of the Cervix and its Influence on Postoperative Infection of Endogenous Origin.** *Zentralblatt für Gynäkologie*, 1925, xlix, 247.

The author is a firm believer in the value of preliminary treatment with x-ray and considers that this not only offers the possibility of improving operative results but that tissues removed after such radiation are extremely important from a histologic standpoint in clearing up many of the problems associated with radiation of tissues in general.

LITTLE.

**Cotte, C., and Bertrand, P.: The Radiology Study of Uterus and Tubes With Injections of Lipiodol.** *Gynécologie et Obstétrique*, 1926, xiv, 81.

A specially constructed apparatus is used with which pressure can be developed and the return flow of lipiodol prevented. Anesthesia is not necessary. Hospitalization and surgical asepsis should be practised. The bladder and rectum should be empty. Ordinarily the injection of from 5 to 6 c.c. of lipiodol will fill the tubes and uterus satisfactorily, but larger amounts are not harmful. The author has seen no harmful results but reports 3 cases from the literature in which there followed signs of a local peritonitis and four deaths. Collargol was used in most of these cases. Fifty of the cases in the author's series were operated upon soon after the injection, and in no case could any evidence be found of peritoneal irritation.

About 20 cases of acute salpingitis with various complications, including a fully developed acute pelvic peritonitis, have been examined by this method without any evidence of harmful effect. It is suggested that in the future it may be possible to follow the course of an acute salpingitis by lipiodol injections and perhaps even to use this method therapeutically.

GOODRICH C. SCHAUFFLER.

**Bertrand, F., Villemur, and Baillat, G.: The Radiologic Exploration of the Cul-de-sac of Douglas by the Injection of Lipiodine.** *Presse Médicale*, Sept. 8, 1926, p. 1139.

Noting that in recent articles on the intrauterine injection of lipiodine (or lipiodol) the authors mention the fact that small amounts of the injected material escape into the culdesac without causing trouble, the authors decided to study this region radiographically by the direct injection of this preparation. They report two cases. After careful sterilization the vaginal wall posterior to the cervix was punctured with a fine needle, 12 cm. long, slightly curved anteriorly. At the depth of 3 cm. the injection of 15 c.c. of the solution was made. Three to five hours later, the picture was taken. In the first case, there was no local discomfort; the next morning the patient complained of slight and transient malaise and nausea. In the second instance, the injection was painful, and was followed at once by malaise and nausea lasting for three or four minutes.

The radiographs in each instance demonstrated pathologic lesions not detected by clinical examination, and in the second patient (the only one coming to operation) the condition found on opening the abdomen tallied with the findings on the plate.

The authors recommend the procedure as a safe and simple method of checking the bimanual findings.

E. L. KING.



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